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Lab Bay Project Area Final Environmental Impact Statement

Ketchikan Pulp Company Long-Term Timber Sale Contract

Volume 1

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Lab Bay Environmental Impact Statement

Lab Bay Project Area Final Environmental Impact Statement

Ketchikan Area - Tongass National Forest
U.S.D.A. Forest Service, Alaska

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Abstract

The USDA Forest Service proposes to harvest approximately 85 million board feet (MMBF) of timber in the Lab Bay Project Area, Thorne Bay Ranger District, Ketchikan Administrative Area, Tongass National Forest. Timber volume would be offered to the Ketchikan Pulp Company (KPC) under the KPC Long-term Timber Sale Contract (A10fs-1042) in a series of separate offerings. The actions analyzed in this EIS are designed to implement direction contained in the Tongass Land Management Plan (TLMP 1979, as amended). The proposed actions are consistent with the TLMP Draft Revision (1991a) and are generally consistent with the 1996 TLMP Draft Revision. The Final EIS describes six alternatives that provide different combinations of resource outputs and spatial locations of harvest units. The alternatives include: 1) No Action, proposing no new harvest from the Project Area for the KPC Long-term Sale Contract at this time; 2) maximizes harvest volume by including all units that are feasible to harvest at this time under federal and state law and forest-wide standards and guidelines; 3) emphasizes retaining timber on high vulnerability karst geology and within Draft Interim Habitat Conservation Areas; 4) emphasizes retaining old-growth blocks and corridors by maintaining the integrity of the Project-defined Habitat Conservation Areas; 5) emphasizes harvest of logical groupings of units within common geographical areas; and 6) emphasizes protection of high vulnerability karst resources, high value wildlife habitats, and high use subsistence areas.

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Proposed Action

In compliance with the National Environmental Policy Act (NEPA) and other federal and state regulations, the Forest Service has prepared this Environmental Impact Statement (EIS) to assess the effects of harvesting timber in the Lab Bay Project Area of northern Prince of Wales Island in Southeast Alaska. The proposed action would harvest up to approximately 85 million board feet (MMBF) of timber from the Lab Bay Project Area. This timber would be made available through up to several offerings to the Ketchikan Pulp Company (KPC) under its Long-Term Timber Sale Contract. If KPC rejects an offering, the timber can be offered to any qualified independent bidder. As many as 80 miles of new road would be built to facilitate timber removal. Three existing, and one new, log transfer facilities (LTF) may be used to implement the timber harvest. Implementing this action would contribute to a current 3-year timber supply for the timber industries. It also would move the Project Area toward the desired future condition as described in the Tongass Land Management Plan (1979, as amended) and would be consistent with Alternative P of the TLMP Draft Revision (1991a). The proposed action would be consistent, in general, with the preferred alternative of the 1996 TLMP Draft Revision. Any potential direct, indirect, or cumulative environmental effects as well as the irreversible or irretrievable commitment of resources that would result from implementing each of the alternatives is described.

Purpose and Need

The purpose and need for the Lab Bay Project is to implement direction contained in the Tongass Land Management Plan (1979, as amended), to help provide a sustained level of timber supply to meet annual and TLMP planning cycle market demand, and to provide local employment in the wood products industry, consistent with providing for the multiple use and sustained yield of all renewable forest resources. Another objective is to provide timber volume that will contribute to a three-year current timber supply under the KPC Long-Term Timber Sale Contract (No. A10fs-1042; Section B0.61 and B0.62) and/or the Ketchikan Area Independent Timber Sale Program. The alternatives and actions considered are possible approaches to meeting this purpose and need. The EIS study process was designed to help insure that, in meeting this purpose and need, the Forest Service makes the most informed decision possible for this Project Area specifically, and for the Tongass National Forest generally. The Lab Bay Project is expected to provide up to approximately 85 MMBF of timber, given the guidance of the Forest Plan. Reasons for scheduling the Lab Bay Sale at this time are described in detail in Appendix A.

Project Area

The 174,357-acre Lab Bay Project Area is located on northern Prince of Wales Island, approximately 70 air miles northwest of Ketchikan in Southeast Alaska. The Project Area includes all National Forest System lands on Prince of Wales Island north of Shakan Bay, Dry Pass, El Capitan Passage, the ridgeline north of Neck Lake, and Whale Pass. Thorne Island, Exchange Island, and other smaller islands along the coastline are also included. Within the Project Area are major drainages associated with Labouchere Bay, Calder Bay, Port Protection, Red Bay, Salmon Bay, Exchange Cove, and Whale Pass. Major freshwater lakes within the area include Red Lake, Salmon Bay Lake, and Twin Island Lake. The Project Area provides habitat for numerous species of wildlife and fish. The heavily roaded topography provides opportunities for recreation, subsistence, and employment to visitors and residents of nearby logging camps and the communities of Port Protection, Whale Pass, Point Baker, Coffman Cove, Naukati, Thorne Bay, Craig, Klawock, and Ketchikan. In recent years, many caves have been discovered and

explored in the area. The visual character also attracts visitors to the area, and represents an important resource for tourism development. Detailed descriptions of the existing condition of the Project Area are provided in Chapter 3 of this EIS.

Issues

Analysis of the proposed land use action in the Lab Bay Project Area has been built upon a number of issues identified during scoping consultation with members of the public, government agencies, and Forest Service. Each issue was analyzed to determine the effect the proposed action would have on the overall management and environment of the Lab Bay Project Area as well as any direct and indirect effects on resource values and uses. This process focused the analysis on eight broad issue areas determined to be significant and within the scope of this EIS, including timber supply, subsistence, wildlife and biodiversity, fish habitat and water quality, recreation, visual resources, social and economic factors, and karst resources.

Alternatives

Six alternatives, including one No Action alternative, are described in detail in Chapter 2 of the Final EIS. Alternative 1 represents the existing condition of the Project Area and its adoption would not implement any of the actions described in this document. This is the No Action alternative against which all others are compared. Alternatives 2, 3, 4, 5, and 6 represent different means of achieving the project purpose and need while responding to the public issues with differing emphasis. Maps of the alternatives are presented at one end of Chapter 2.

All of the action alternatives meet Forest Plan objectives and standards, but do so with different configurations of roads and harvest units. Alternative 2 proposes harvest on all units that are feasible to harvest at this time under federal and state laws and forest-wide standards and guidelines. Alternative 3 emphasizes the protection of high vulnerability karst resources and Draft Interim-designated HCA's. Alternative 4 emphasizes the protection of large blocks of wildlife habitat and connecting travel corridors. Alternative 5 proposes harvest of units located in common geographical areas. Alternative 6 of the Final EIS emphasizes the protection of high vulnerability karst resources and high value subsistence, wildlife, and visual resources, and responds to substantive comments received on the Draft EIS.

Environmental Impacts and Mitigation

The Final EIS identifies the site-specific impacts of the proposed alternatives, including the No Action Alternative. Environmental Consequences are described in detail for each resource in Chapter 3. Chapter 2 provides a summary and comparison of environmental consequences by alternative. Implementation of Alternative 6, the preferred alternative for the Final EIS, would result in harvest of approximately 40 MMBF of timber from 46 harvest units and 29 miles of road.

Forest-wide standards and guidelines were applied in the design of the proposed harvest units and roads. A large number of site-specific mitigation measures were incorporated into the harvest unit and road design. Chapter 2 provides a description of site-specific mitigation measures; Appendix C provides a listing of each unit incorporating site-specific measures. Chapter 2 includes a description of Project-specific monitoring recommendations as well as Forest Plan and Ketchikan Area monitoring programs.

Public Participation

Comments and suggestions were solicited from the public and interested Federal and State agencies beginning with formal scoping in August 1991. This input helped in determining the issues to be addressed and their scope.

Project Updates were circulated to the Project Mail List addressees in December 1992, November 1994, and April 1995.

The Lab Bay Draft EIS was made available to the public on August 4, 1995. The comment period closed on September 30, 1995. ANILCA subsistence hearings and open houses were held in eight communities during the comment period. Written comments on the Draft EIS were received from 42 individuals, organizations, and agencies. As a result of this input, a new alternative, Alternative 6, was included in the Final EIS. The alternative responds to many of the substantive public comments received on the Draft EIS and during subsistence hearings. Other changes between the Draft and Final EIS are summarized in Chapter 2.

Chapter 1
Purpose and Need

Chapter 1
Purpose and Need

Key Terms

Forest-wide Standards and Guidelines - These are the standards and guidelines that apply to all, or most, areas of the Forest. Each management prescription includes a list of those that apply to that land use designation.

Land Use Designation (LUD) - The method of classifying land uses presented in the Forest Plan (Tongass Land Management Plan [TLMP 1979, as amended]).

Management Area (MA) - An area one or more Value Comparison Unit (VCU) in size for which management direction was provided in the Tongass Land Management Plan.

MMBF - Million board feet, or about 220 conventional highway logtruck loads of logs.

Offering - A Forest Service specification of timber harvest units, subdivisions, roads, and other facilities and operations to meet the requirements of a timber sale contract.

Primary Sale Area (PSA) - The "Sale Area" designated in the KPC Long-Term Timber Sale contract is comprised of portions of Allotments E, F, and G. The Sale Area is often termed the "Primary Sale Area" (PSA). The remainder of Allotments E, F, and G are often termed the "Contingency Area" for the Contract. Allotments E. F, and G approximately correlate to the Ketchikan Administrative Area of the Tongass National Forest.

Record of Decision (ROD) and Contingency Area - A document, based on information disclosed in the Final EIS, which identifies the alternative chosen, mitigation and monitoring measures to be implemented, and other information relative to the decision. The Lab Bay ROD will be issued by the Ketchikan Area Forest Supervisor.

Scoping Process - Activities used to determine the scope and significance of a proposed action, what level of analysis is required, what data are needed, and what level of public participation is appropriate.

Tongass Land Management Plan (TLMP) - The 10-year land allocation plan for the Tongass National Forest, also known as the Forest Plan. The TLMP was completed in 1979, amended in 1986 and again in 1991 (TLMP 1979, as amended). The TLMP currently is undergoing revision; the Draft Environmental Impact Statement (EIS) for the Proposed Revised Forest Plan was issued in 1990; a Supplement to the TLMP Revision Draft EIS was issued in 1991 (TLMP Draft Revision 1991a). Reference in the Lab Bay EIS to the TLMP Draft Revision (1991a) is to the Draft EIS as proposed to be implemented in Alternative P of the Supplement, unless otherwise noted. A new Draft Revision to the Forest Plan was released in April 1996 (1996 TLMP Draft Revision). Until a Draft Revision is approved, the TLMP (1979, as amended) remains in effect.

Value Comparison Unit (VCU) - Areas that generally encompass a drainage basin to provide a common set of areas where resource inventories could be conducted and resource interpretations made.

Introduction

In compliance with the National Environmental Policy Act (NEPA) and other federal and state regulations, the Forest Service has prepared this Environmental Impact Statement (EIS) to assess the effects of harvesting timber in the Lab Bay Project Area of northern Prince of Wales Island in Southeast Alaska. This action is proposed to help meet the terms of the Ketchikan Pulp Company (KPC) Long-term Sale contract or independent sales by making approximately 85 million board feet (MMBF) of timber available for harvest. Implementing this action would contribute to a current 3-year timber supply for the timber industries. It also would move the Project Area toward the desired future condition as described in the Tongass Land Management Plan (1979, as amended) and would be consistent with Alternative P of the TLMP Draft Revision (1991a). Project planning was completed prior to release of the 1996 TLMP Draft Revision in April 1996. However, the proposed action would be consistent, in general, with the preferred alternative of the 1996 TLMP Draft Revision. Any potential direct, indirect, or cumulative environmental effects as well as the irreversible or irretrievable commitment of resources that would result from implementing each of the alternatives is described.

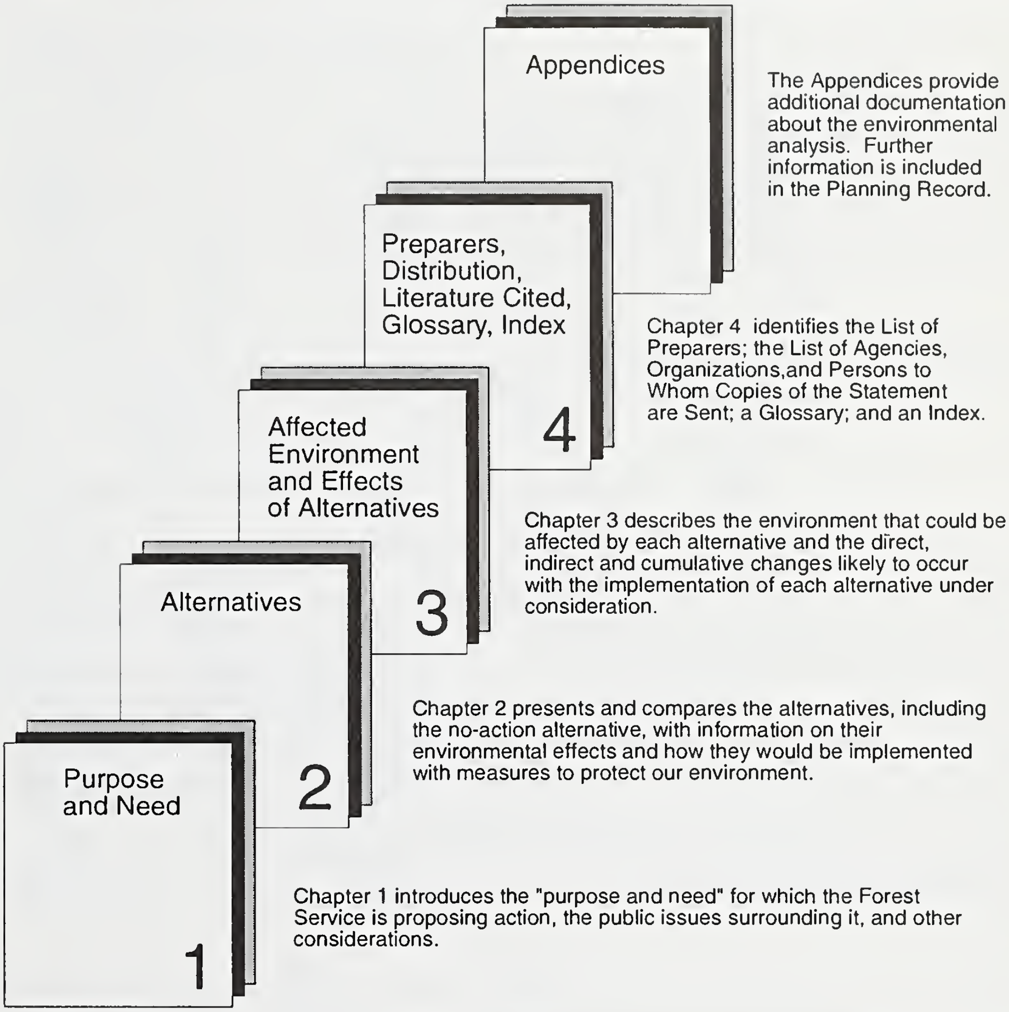
Decision to be Made

Based on the information in this EIS, the Forest Supervisor will decide whether and when to make timber available for harvest and how much to make available. Other decisions include the location and design of harvest units, access management plans, mitigation measures, and construction of a tie road between Calder Bay and Labouchere Bay. The Forest Supervisor can decide to (1) select one of the alternatives presented in the Final EIS; (2) modify an alternative as long as the environmental consequences of that action have been fully analyzed in the Final EIS; or (3) reject all alternatives and request further analysis. If an alternative is selected, it will be documented in the Record of Decision (ROD).

Document Organization

This EIS is presented in four chapters, with supporting materials included in Appendices A through Q as illustrated in Figure 1-1. Chapter 1 describes the purpose and need for the proposed action and includes background information necessary to understand the scope of the decision to be made. Chapter 2 presents and compares the action and no action alternatives and summarizes the effects of each alternative on the area resources. Chapter 3 combines a description of the affected environment with disclosure of the possible environmental consequences of the proposed alternatives. Chapter 4 includes the list of preparers, the distribution list, cited literature, glossary, and index. The appendices provide additional information to support the environmental analysis.

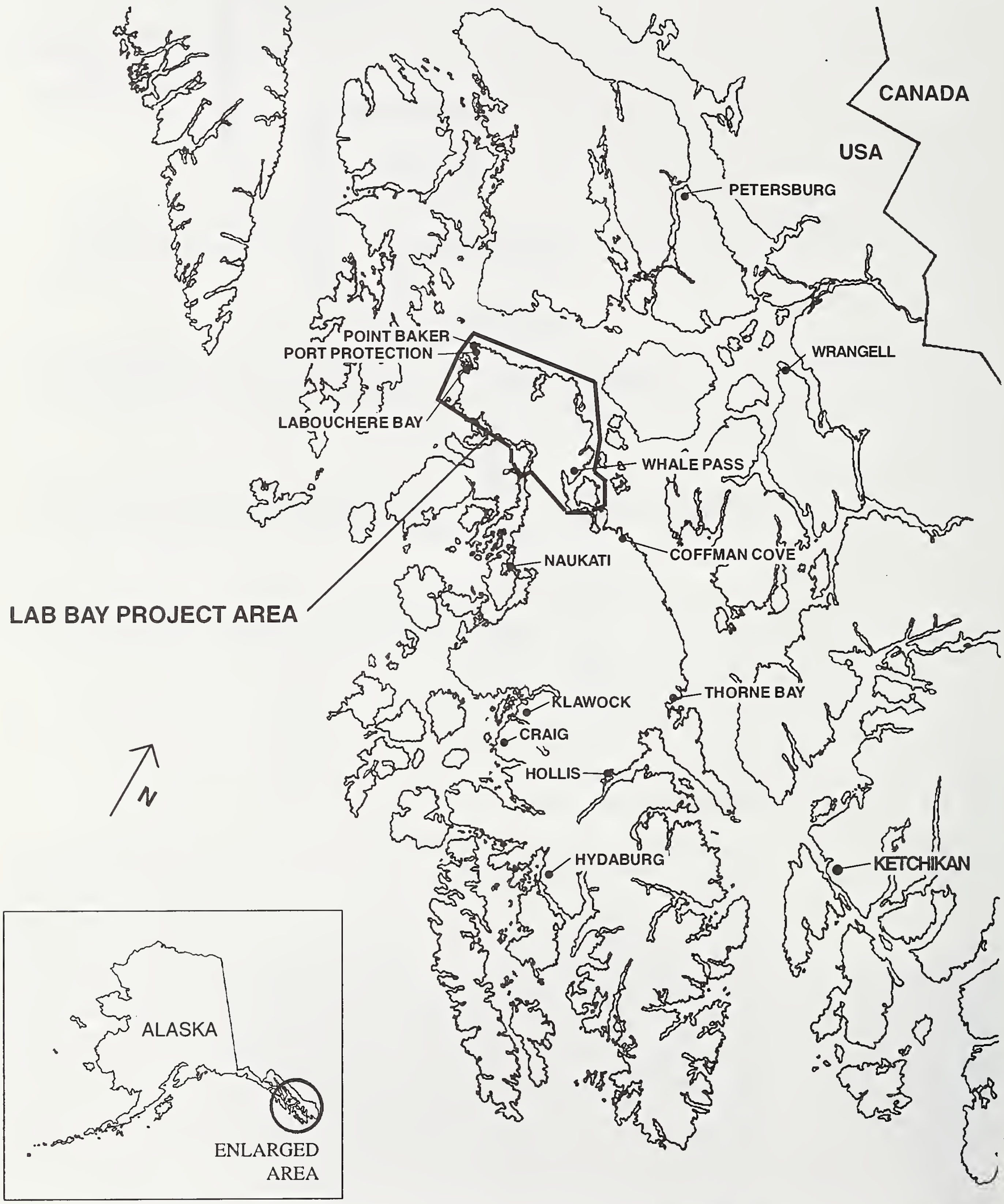
Figure 1-1
How This Document is Organized



Project Area

The 174,357-acre Lab Bay Project Area is located on northern Prince of Wales Island, approximately 70 air miles northwest of Ketchikan in Southeast Alaska (Figure 1-2). The Project Area includes all National Forest System lands on Prince of Wales Island north of Shakan Bay, Dry Pass, El Capitan Passage, the ridgeline north of Neck Lake, and Whale Pass. Thorne Island, Exchange Island, and other smaller islands along the coastline are also included. Within the Project Area are major drainages associated with Labouchere Bay, Calder Bay, Port Protection, Red Bay, Salmon Bay, Exchange Cove, and Whale Pass. Major freshwater lakes within the area include Red Lake, Salmon Bay Lake, and Twin Island Lake. The Project Area provides habitat for numerous species of wildlife and fish. The heavily roaded topography provides opportunities for recreation, subsistence, and employment to visitors and residents of nearby logging camps and the communities of Port Protection, Whale Pass, Point Baker, Coffman Cove, Naukati, Thorne Bay, Craig, Klawock, and Ketchikan. In recent years, many caves have been discovered and explored in the area. The visual character also attracts visitors to the area, and represents an important resource for tourism development. Detailed descriptions of the existing condition of the Project Area are provided in Chapter 3 of this EIS.

Figure 1-2
Lab Bay Project Vicinity



The environmental impacts of each alternative on some resources may extend beyond the Project Area boundary. Further detail on these affected areas is provided in Chapter 3.

The Proposed Action

The proposed action would harvest up to approximately 85 million board feet (MMBF) of timber from the Lab Bay Project Area, located on northern Prince of Wales Island. This timber would be made available through up to several offerings to the Ketchikan Pulp Company (KPC) under its Long-Term Timber Sale Contract. If KPC rejects an offering, the timber can be offered to any qualified independent bidder. As many as 80 miles of new road would be built to facilitate timber removal. Three existing, and one new, log transfer facilities (LTF) may be used to implement the timber harvest.

The proposed action is consistent with implementation of the Forest Plan known as the Tongass Land Management Plan (TLMP 1979, as amended), thereby moving from the existing forest condition toward the desired future condition.

Purpose and Need

The purpose and need for the Lab Bay Project is to implement direction contained in the Tongass Land Management Plan (1979, as amended), to help provide a sustained level of timber supply to meet annual and TLMP planning cycle market demand, and to provide local employment in the wood products industry, consistent with providing for the multiple use and sustained yield of all renewable forest resources. Another objective is to provide timber volume that will contribute to a three-year current timber supply under the KPC Long-Term Timber Sale Contract (No. A10fs-1042; Section B0.61 and B0.62) and/or the Ketchikan Area Independent Timber Sale Program. The alternatives and actions considered are possible approaches to meeting this purpose and need. The EIS study process was designed to help insure that, in meeting this purpose and need, the Forest Service makes the most informed decision possible for this Project Area specifically, and for the Tongass National Forest generally. The Lab Bay Project is expected to provide up to approximately 85 MMBF of timber, given the guidance of the Forest Plan.

Implementation of TLMP

The Project Area is located entirely within the long-term contract Primary Sale Area. Under TLMP, approximately 89 percent of the Project Area has been given Land Use Designation (LUD) III or IV. The TLMP schedules timber sale preparation for Management Areas K01 and K03 in the Project Area. A comparison of the Desired Future Condition for the Project Area, as reflected in TLMP direction, with the existing condition shows the need to convert suitable stands of old growth to managed productive stands capable of long-term timber production.

Timber Demand

Section 101 of the Tongass Timber Reform Act of 1990 (TTRA) directs the Forest Service to "...to the extent consistent with providing for the multiple use and sustained yield of all renewable forest resources, seek to provide a supply of timber from the Tongass National Forest which (1) meets the annual market demand for timber from such forest and (2) meets the market demand from such forest for each planning cycle." Section 101 of the TTRA specifies that Forest Service efforts to seek to meet market demand are subject to appropriations, National Forest Management Act (NFMA) requirements, and other applicable law. Providing a timber supply from the Tongass for sustained local wood products industry employment and related economic and social benefits is an objective of the TLMP, the Alaska National Interest Lands Conservation Act (ANILCA), as amended by the TTRA, and the KPC long-term contract.

There is demonstrated mill capacity in the region to process logs, if a supply of timber is available. There is also a projected need for the timber volume being considered from this Project Area for the Forest Service to come closer to meeting an objective of providing a three-year supply of timber under contract to the existing dependent industry (see Appendix A), as a means

of providing for stability in relation to fluctuating market demand (Morse 1995). There is a substantial component of the economy of Southeast Alaska that is dependent on a viable timber industry. Based on these factors, the need for the project is clearly indicated.

Reasons for Scheduling the Environmental Analysis of the Lab Bay Project Area

Reasons for scheduling the Lab Bay Project Area at this time, for detailed consideration of timber harvest under the long-term timber sale contract between Ketchikan Pulp Company (KPC) and the Forest Service (Contract No. A10fs-1042) and/or under independent timber sales, may be summarized as follows:

- The Lab Bay Project Area contains a sufficient amount of harvestable timber volume designated as LUD III or IV, and therefore is appropriate for harvest under the Tongass Land Management Plan (TLMP). Available information indicates harvest of the amount of timber being considered for this project can occur consistent with TLMP standards and guidelines and other requirements for resource protection. Analysis also indicates harvest of the amount of timber being considered can occur consistent with the proposed TLMP Revision standards and guidelines and other resource protection requirements.
- Areas with available timber both inside and outside the designated long-term contract sale area will be necessary for harvest in order to meet timber supply requirements under the contract. The Lab Bay Project Area is within the designated sale area for the long-term contract. The contract requires the Forest Service to look first to the designated sale area for timber to meet the contract's supply requirements before offering timber outside that area.
- Areas with available timber both within and outside the designated sale area will also be necessary to consider for harvest in order to seek to provide a supply of timber from the Tongass National Forest which (1) meets the annual market demand for timber from such forest and (2) meets the market demand from such forest for each planning cycle, pursuant to Section 101 of the Tongass Timber Reform Act (TTRA).
- Effects on subsistence resources are projected to differ little according to which sequence these areas are subjected to harvest. Harvesting other areas on the Tongass National Forest with available timber is expected to have similar potential effects on resources, including those used for subsistence because of widespread distribution of subsistence use and other factors. Harvest of these other areas is foreseeable, in any case, over the forest planning horizon under either the existing or proposed revised TLMP.
- Providing substantially less timber volume than required by the long-term contract with KPC and/or required to meet TLMP and TTRA Section 101 timber supply and employment objectives in order to avoid harvest in the Lab Bay Project Area or other project areas would not meet contract requirements and is otherwise not necessary or reasonable.
- It is reasonable to schedule harvest in the Lab Bay Project Area at the present time rather than other areas in terms of previous harvest entry and access, level of controversy over subsistence and other effects, and the ability to complete the National Environmental Policy Act (NEPA) process and make timber available to meet long-term contract requirements by the time it is reasonably necessary to do so. Other areas that are reasonable to consider for harvest in the near future are the subject of other project EIS's that are currently ongoing or scheduled to begin soon.

Additional information about why the Lab Bay area was selected is provided in Appendix A.

Related NEPA Analyses

This EIS considers several alternative actions and their environmental effects in and adjacent to the Lab Bay Project Area. Similar actions, some with overlapping implementation schedules, are planned within the KPC contract area. The harvesting of units previously approved in the Lab Bay vicinity, as part of the 825.9 million board feet authorized for the KPC contract under the 1989-94 Long-term Sale EIS, has been completed. The Final EIS for the Central Prince of Wales Project, which shares its northern boundary with the Lab Bay Project Area, was released in 1993. Harvest of approximately 267 MMBF began in the summer of 1994. A Supplemental EIS for the Central Prince of Wales Project was completed in 1995.

Draft EIS's have also been published for the Control Lake Project located on Prince of Wales Island, and the Upper Carroll Project on Revillagigedo Island.

This EIS describes potential combined effects of the action alternatives with past land use actions, currently proposed actions (most notably the Central Prince of Wales, Polk Inlet and Control Lake Projects) and reasonably foreseeable future actions. Other recent or proposed NEPA actions that influence the Lab Bay area have been considered in this analysis, including proposed interim forest guidelines for wildlife viability and karst resources.

Tongass Land Management Plan (TLMP)

TLMP, as amended
The original TLMP of 1979 was amended in 1986 and 1991. TLMP, as amended, is the Forest Plan in effect until a revised Plan is in place. This EIS references TLMP and its amendments as: TLMP (1979, as amended).

TLMP Draft Revision (1991a)
As required by NFMA, TLMP is undergoing revision. The TLMP Revision Draft EIS was completed in 1990. A Supplement to the Revision was necessitated by TTRA and was completed in 1991. This EIS references these TLMP revisions as: TLMP Draft Revision (1991a).

1996 TLMP Draft Revision
The Revised Supplement to the Draft Environmental Impact Statement, Proposed Revised Forest Plan, (1996 TLMP Draft Revision) was released in April 1996 and is currently under review.

The Lab Bay EIS tiers to TLMP (1979, as amended). It also proposes management consistent with the TLMP Supplement Draft EIS, Proposed Revised Forest Plan, Alt. P, standards and guidelines (TLMP 1991a). The proposed management is also generally consistent with the preferred alternative of the 1996 TLMP Draft Revision.

The Planning Process

National Forest planning involves several levels of decisions. The decision-making begins with long-range planning at the national level, continuing down through the regional and forest levels to the project level. The Lab Bay Project is a part of this process. This EIS is a project level analysis; as such, it does not attempt to address decisions made at higher levels. It does, however, implement direction provided at those higher levels. Specifically, the Lab Bay Project would implement direction in the Forest Plan.

National Level

The 1990 Program and Assessment, developed in accordance with the Forest and Rangeland Renewable Resources Planning Act of 1974 as amended, provides national direction for the management of national forests and grasslands. An assessment of the forest and rangeland renewable resources is required every 10 years, and development of a program for managing those resources is required every 5 years.

Regional Level

The Alaska Regional Guide (USDA Forest Service 1983) addresses issues specific to Alaska, and establishes management standards and guidelines for the Tongass National Forest. TLMP (1979, as amended) incorporates this regional direction.

Forest Level

The National Forest Management Act of 1976 (NFMA) directs each Forest to prepare an overall plan of activities. The Tongass Land Management Plan (TLMP) was completed in 1979 to guide management of the Tongass National Forest. TLMP was amended in 1986 and again in 1991 as a result of the Tongass Timber Reform Act (TTRA). TLMP is currently undergoing revision, as mandated by the NFMA; a Supplement to the Revision Draft EIS was issued in 1991 (TLMP Draft Revision 1991a). A new TLMP Draft Revision EIS (1996 TLMP Draft Revision) was released in April 1996. The two TLMP Draft Revisions are incorporated by reference. Until the ROD for the Revision is signed, the TLMP (1979, as amended), remains in effect.

Project Level Decisions

The Lab Bay EIS tiers to the TLMP EIS (TLMP 1979, as amended) and the Alaska Regional Guide EIS (USDA Forest Service 1983). It also proposes management consistent with the preferred alternative (Alternative P) in the proposed TLMP Draft Revision (1991a). In cases of conflicting direction, the more restrictive standards and guidelines were applied.

Planning for the Lab Bay Project was completed prior to release of the 1996 TLMP Draft Revision. However, the preferred alternative of the 1996 TLMP Draft Revision incorporates many elements of Alternative P of the 1991 Draft Revision. Therefore, the management activities proposed herein are expected to be consistent, in general, with the preferred alternative of the 1996 Draft Revision.

To help implement the Forest Plan, an Interdisciplinary (ID) Team evaluated management opportunities in and adjacent to the Lab Bay Project Area, conducted scoping activities, and developed frameworks for defining and evaluating each of the proposed action alternatives. Potential environmental consequences of each alternative were analyzed and compared. Based on this analysis, decisions to be made by the Forest Supervisor include:

- The timber volume to make available under the contract from this Project Area;
- The location, design, and schedule of timber harvest, silvicultural, road construction, and reforestation management practices, including the construction of a tie road between Calder Bay and Lab Bay;
- Access management measures (road, trail, and area restrictions and closures); and
- Mitigation measures, Best Management Practices (BMP's), and monitoring measures.

In arriving at these decisions, the Forest Supervisor can: 1) select one of the alternatives analyzed within the Final EIS; 2) choose a modified alternative, if the environmental consequences of that action have been analyzed; or 3) reject all of the alternatives.

Land Use Designations

Desired Future Condition

The current Forest Plan (TLMP 1979, as amended) defines a desired future condition through the Management Direction/Emphasis for each Management Area. This direction includes goals for timber, recreation, visuals, fish, wildlife, and other resources in each area. More than half of the Forest is anticipated to remain in a basically unmodified condition over time under the Forest Plan. The Plan projected that timber-related employment would remain stable if the more marginal timber could be harvested. Specific Management Direction/Emphasis for each Management Area in the Lab Bay Project Area is provided in TLMP (1979, as amended).

The Management Direction/Emphasis was further refined as the desired future condition for each LUD in the TLMP Draft Revision (1991a). The desired future condition consists of a mosaic of timber stands of varying sizes and ages, interspersed with areas of old growth and nonforest vegetation, furnishing a sustained yield of timber in balance with other resources and uses. Roads will be provided to suitable timberlands allowing the conversion of old growth timber to successive stands of younger trees. Riparian areas and water quality will be managed to benefit dependent resources; fish habitat will be maintained or improved. Sensitive visual resources, particularly as viewed from salt water, will be conserved. Overall, the forest will be highly modified through timber harvest and other human activities over the planning horizon of 150 years (TLMP Draft Revision 1991a).

Achievement of the desired future condition will require many decades of forest management. Land use designations (LUD's) are ways of managing an area of land and the resources it contains. LUD's may emphasize certain resources (such as wilderness or old-growth wildlife habitat), or combinations of resources (such as maintaining scenic quality in combination with timber harvesting). Each land use designation has a detailed management prescription, which includes standards and guidelines.

TLMP (1979, As Amended)

The Lab Bay Project Area is classified within three of seven Land Use Designations of the TLMP (1979, as amended). These are displayed in Table 1-1 and Figure 1-3. Each LUD has a specific set of management prescriptions that direct land use activities. Management direction for LUD's occurring in the Lab Bay Project Area is summarized below.

LUD II

The TLMP (1979, as amended), allocated certain lands to the LUD II designation.

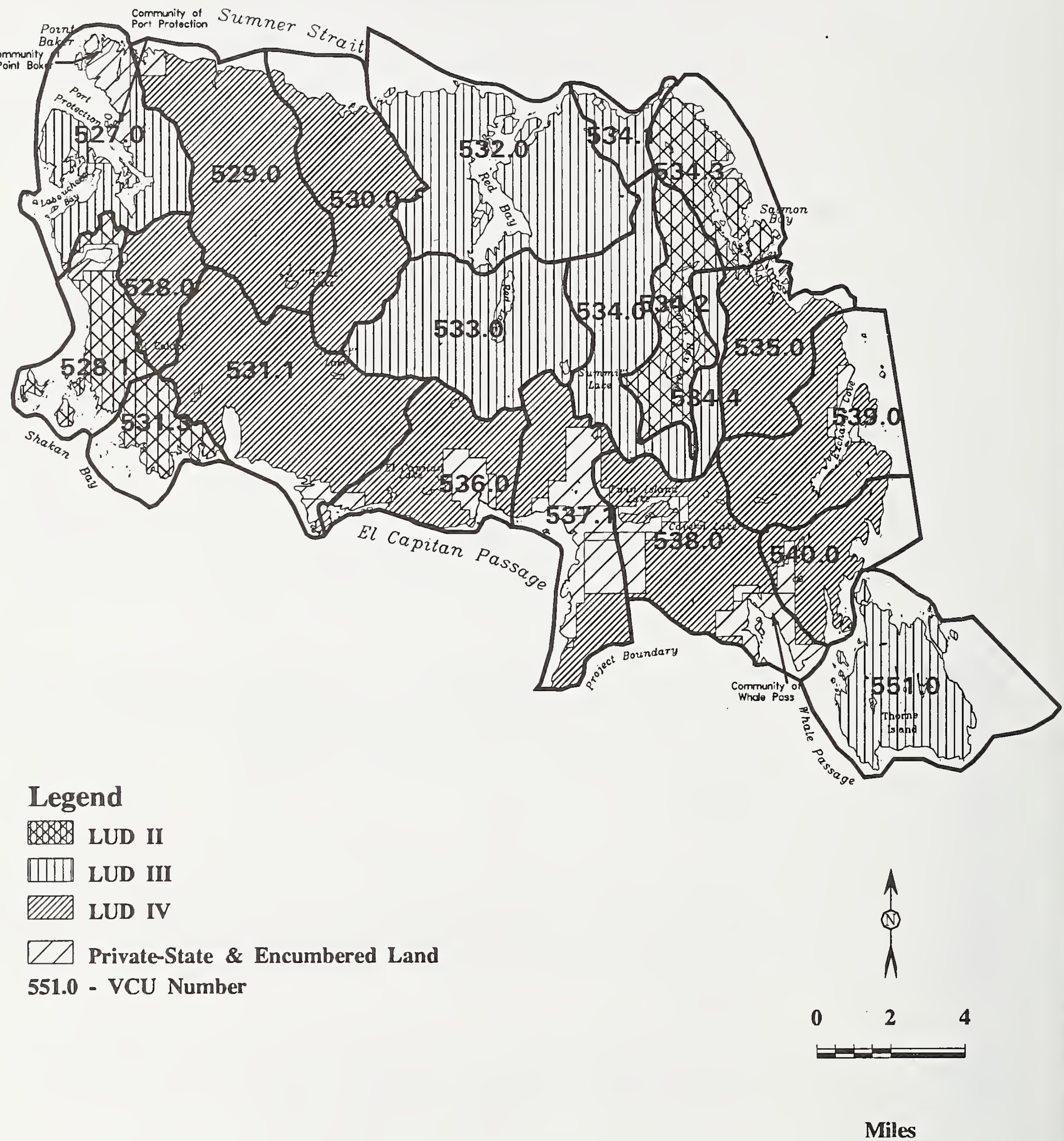
These areas are to be managed in a roadless state to retain their wildland character, although wildlife and fish habitat improvement and primitive recreation facility development is allowed. Commercial timber harvest is not permitted. Timber can be salvaged to prevent significant damage to other resources (i.e., removal of windfall in an important fish stream). The Project Area includes 18,240 acres congressionally designated as LUD II.

LUD III

These lands are managed for a variety of uses, with emphasis upon providing the greatest combination of benefits. These areas usually have high amenity values in conjunction with high commodity values. Allowances in calculated potential timber yield have been made to meet multiple-use objectives. Management direction includes:

- Potential timber yields will be reduced to the extent needed to protect important biological and aesthetic values;
- Both permanent and temporary roads are allowed;
- Roads are located and designed to retain important recreational and scenic qualities;

Figure 1-3
Lab Bay Project Area Land Use Designations and VCU's
TLMP (1979, as amended)



Source: Ketchikan Area GIS

- Mineral development is subject to existing laws and regulations;
- Needed trails can be provided;
- A full range of recreational facilities is permissible; and
- A full range of fisheries improvement projects is permitted.

The Project Area includes 55,864 acres designated as LUD III.

LUD IV

These areas provide opportunities for intensive development of resources with emphasis on commodity or market resources. When conflicts arise concerning competing resource use, resolution most often would be in favor of commodity values. Allowances in calculated potential timber yield have been made to provide for protection of physical and biological productivity. Management direction includes:

- Timber is to be harvested primarily by clearcutting;
- Potential timber yields are to be reduced only to the extent necessary to protect key biological and aesthetic values;
- Permanent or temporary roads may be built;
- Mineral development is subject to existing laws and regulations;
- Needed trails can be provided;
- A full range of recreational facilities is permitted;
- A full range of fisheries improvement projects is permitted; and
- Motorized use is permitted.

The Project Area includes 86,040 acres designated as LUD IV.

Table 1-1

Summary of Project Area Acres within TLMP (1979, as amended) Land Use Designations[1]

VCU	LUD II[2]	LUD III[3]	LUD IV[3]
527.0	0	6,156	28
528.0	0	0	4,354
528.1	4,305	0	16
529.0	0	0	14,837
530.0	0	0	10,396
531.1	0	0	16,028
531.3	2,929	0	7
532.0	0	14,979	0
533.0	0	13,559	0
534.0	0	8,991	0
534.1	0	1,940	0
534.2	6,363	0	0
534.3	4,642	42	0
534.4	0	2,434	0
535.0	0	17	6,877
536.0	0	0	6,814
537.1	0	0	5,261
538.0	0	0	8,445
539.0	0	0	8,359
540.0	0	0	4,618
551.0	0	7,746	0
Total	**18,240**	**55,864**	**86,040**

Source: Ketchikan Area GIS

1 Table reflects unencumbered National Forest System lands. The Project Area includes an additional 7,415 acres of encumbered National Forest System lands and 6,798 acres of state and private lands.

2 Congressionally-designated LUD II.

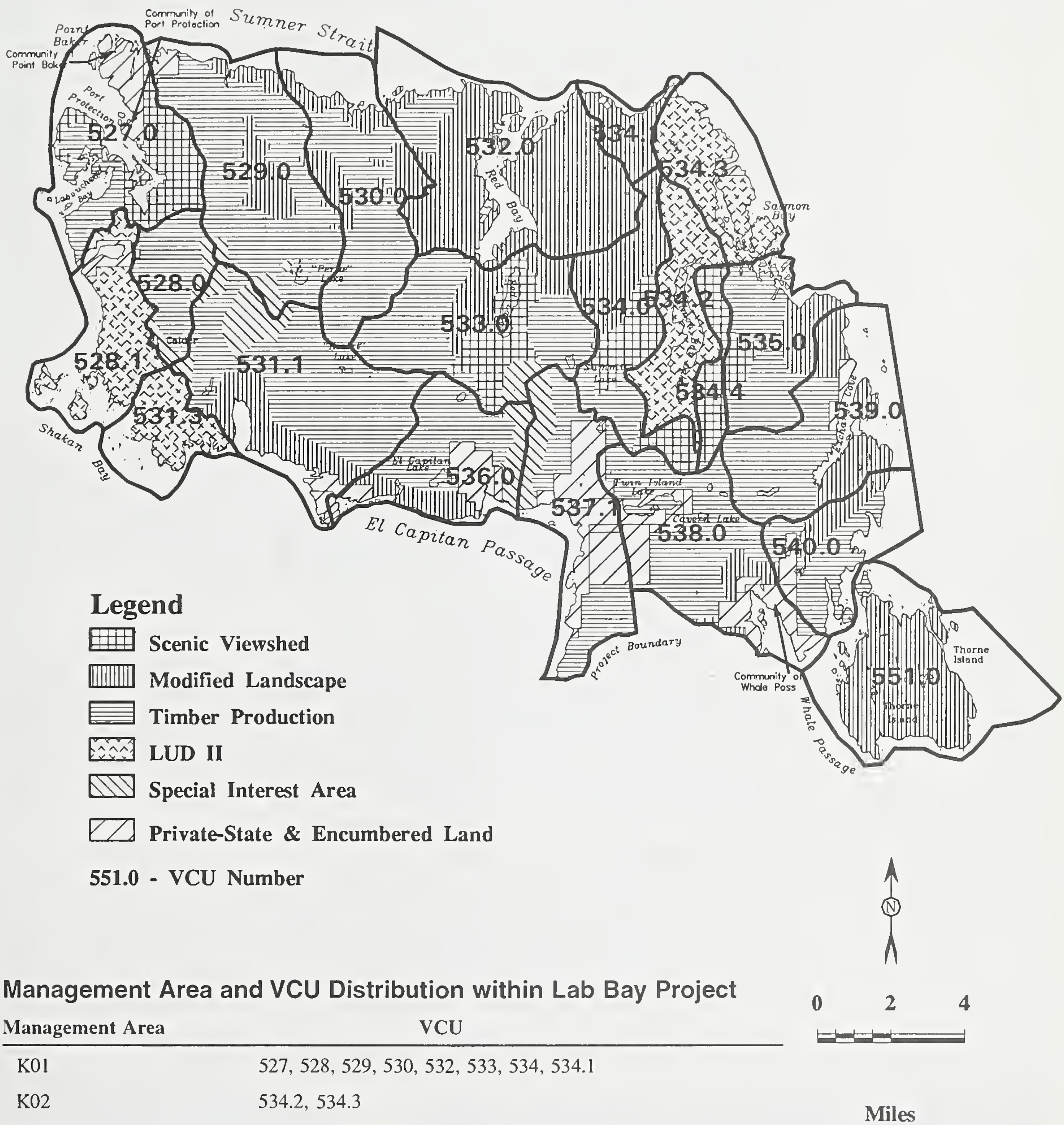
3 LUD's III and IV contain 390 acres of small islands.

TLMP Draft Revision (1991a)

Although the Forest is continuing to operate under the TLMP (1979, as amended), this project also has adopted standards and guidelines consistent with the TLMP Draft Revision (1991a). Where land use designations differ, the most restrictive standards and guidelines have been applied. The TLMP Draft Revision (1991a) recognizes 23 LUD's, reflecting specific land management objectives. Nine of these LUD's apply to the Lab Bay Project Area: Timber Production, Modified Landscape, Scenic Viewshed, LUD II, Special Interest Area, Wild Rivers and Scenic Rivers, Stream and Lake Protection, and Beach Fringe and Estuary. The distribution of the nine LUD's on the Project Area is displayed in Figure 1-4. Wild and Scenic River LUD's are included entirely within the Salmon Bay LUD II on the Project Area. Stream and Lake Protection and Beach Fringe and Estuary LUD's overlap with other LUD's and are not displayed on Figure 1-4.

The Timber Production, Modified Landscape, and Scenic Viewshed LUD's allow commercial timber harvest. Together these comprise 134,854 acres (Table 1-2). The majority of the Lab Bay Project Area is classified as Timber Production. Modified Landscape and Scenic Viewshed allocations are distributed throughout the Project Area, primarily on the prominent ridges as viewed from saltwater.

Figure 1-4
Lab Bay Project Area Land Use Designations and VCU's TLMP Draft Revision (1991a)



Management Area and VCU Distribution within Lab Bay Project

Management Area	VCU
K01	527, 528, 529, 530, 532, 533, 534, 534.1
K02	534.2, 534.3
K03	531.1, 534.4, 535, 536, 537.1, 538, 539, 540, 551
K03A	528.1, 531.3

Source: Ketchikan Area GIS

Programmed timber harvest is not allowed in the following Project Area LUD's: LUD II (legislated areas where development is restricted), Wild River or Scenic River (located within LUD II on the Project Area), Special Interest Areas, Beach Fringe and Estuary, and portions of the Stream and Lake Protection LUD. Two LUD II areas are situated in the southwest (Mt. Calder/ Mt. Holbrook) and northeast (Salmon Bay Lake) of the Project Area and occupy approximately 6 percent of the area.

A brief description of the management approach for each TLMP Draft Revision (1991a) LUD in the Project Area is provided below. Table 1-2 provides a summary of acres within each LUD by VCU.

Timber Production (74,647 acres)

Industrial wood production is the primary emphasis in this LUD. These lands will be managed to promote the development of the timber resource and for maximum long-term timber production. Timber harvest may include both even- and uneven-aged silvicultural methods. Harvest patterns and silviculture treatments will be developed with consideration for fish and wildlife habitat and recreation opportunities. This is primarily a subset of the former LUD IV designation. Timber production is the largest LUD within the Project Area and is located primarily in two large blocks. One of these blocks is mostly west of El Capitan Peak and east of the Mt. Calder/Mt. Holbrook LUD II area. The second block is located north and west of the Whale Pass community.

Modified Landscape (46,054 acres)

Modified Landscape LUD provides a mixture of management options while minimizing the visual impact of development activities. Timber harvest may be apparent on the landscape; however, harvest activities will be restricted to retain foreground visual quality and recreation opportunities. The modified landscape designation provides additional opportunity for treatments optimizing fish and wildlife habitats. This is primarily a subset of the former LUD III designation. Modified Landscape LUD primarily occurs on Thorne Island and the lands surrounding Red Bay.

Scenic Viewshed (14,153 acres)

Scenic Viewshed LUD is managed to provide scenic landscapes, vistas, and travel corridors in areas where the public has high expectations for visual quality. Timber harvest is limited to ensure compliance with visual standards and guidelines. Where harvest activity is proposed, it is expected that selective cutting techniques and even-aged systems with moderate impact will be employed. This is primarily a subset of the former LUD III designation. The Scenic Viewshed LUD primarily occurs on the lands surrounding Port Protection, Red Lake, and the Salmon Bay Lake LUD II area.

LUD II (legislated) (18,240 acres)

These congressionally-designated areas are to be managed primarily in a roadless state to retain their wildland character. Development activities are restricted to prevent significant change to the natural state. Commercial timber harvesting is not permitted, yet some opportunities are to be made available for wildlife and fish habitat improvement and primitive recreation facility development. Within the Project Area are two LUD II areas: Mt. Calder/Mt. Holbrook (5,229 acres) and Salmon Bay (5,399 acres). Salmon Bay is located in the northeast corner of the Project Area and Mt. Calder/Mt. Holbrook is located along the southwest coast of the Project Area. The Salmon Bay LUD II encompasses two waterways that have been recommended for further special protection: Salmon Bay Lake as a Wild River, and Salmon Bay Stream as a Scenic River. These are described below.

Table 1-2
Summary of Acres Within TLMP Draft Revision (1991a) Land Use Designations[1]

VCU	Timber Production	Modified Landscape	Scenic Viewshed	LUD II[2]	Special Interest Area	Stream & Lake Protection[3]	Beach Fringe & Estuary[3]
5270	2,276	0	3,888	0	0	927	1,690
5280	3,550	0	4	0	800	671	0
5281	0	0	0	4,305	0	438	782
5290	11,609	2,467	63	0	698	2,527	405
5300	7,285	3,101	0	0	0	1,818	488
5311	10,925	3,040	0	0	2,060	2,226	557
5313	0	0	0	2,929	0	264	828
5320	1,219	13,746	0	0	0	2,109	2,716
5330	7,080	2,495	3,341	0	642	2,219	77
5340	1,616	3,822	3,554	0	0	1,386	0
5341	0	1,937	0	0	0	336	313
5342	0	0	0	6,363	0	1,818	0
5343	0	0	0	4,643	0	616	1,567
5344	83	0	2,351	0	0	363	0
5350	4,525	1,485	870	0	0	1,246	802
5360	4,427	1,305	32	0	1,025	1,168	446
5371	3,812	0	0	0	1,435	578	117
5380	7,420	871	50	0	0	1,251	2
5390	5,469	2,840	0	0	0	1,743	1,125
5400	3,238	1,376	0	0	0	1,108	1,089
5510	113	7,569	0	0	0	1,395	2,041
Total	**74,647**	**46,054**	**14,153**	**18,240**	**6,660**	**26,207**	**15,045**

Source: Ketchikan Area GIS

[1] Table reflects unencumbered National Forest System lands. The Project Area includes an additional 7,415 acres of encumbered National Forest System lands, 6,798 acres of state and private lands and 390 acres of small islands without LUD's assigned.

[2] LUD II includes Scenic River and Wild River LUD acreage that occurs within the LUD II boundary.

[3] Stream and Lake Protection and Beach Fringe & Estuary LUD's are included entirely within other LUD's.

Wild River

Salmon Bay Lake is suitable and recommended for designation as a Wild River (TLMP Draft Revision Appendix E, 1991a). This LUD directs the maintenance, enhancement, and protection of the character of the river and lake which qualifies them for inclusion in the National Wild and Scenic Rivers System. No timber harvest is allowed within this LUD. This LUD is included entirely within the Salmon Bay LUD II.

Scenic River

Salmon Bay Stream is suitable and recommended for designation as a Scenic River (TLMP Draft Revision Appendix E, 1991a). The purpose of this LUD is to maintain, enhance, and protect the natural free-flowing character of the river and lake which allows its eligibility in the Scenic River classification. Forestland is generally classified as suitable for harvest in the LUD, yet within the Lab Bay Project Area, this LUD is located entirely within the Salmon Bay LUD II area.

Special Interest Areas (6,660 acres)

The management emphasis in this LUD is to protect the natural characteristics which qualify areas for designation as unique within the Tongass National Forest. In the Lab Bay Project Area this LUD provides for the protection and interpretation of selected areas with unique geological (karst) features. The Project Area contains four Special Interest Areas units: El Capitan, Perue Peak, North Perue Peak, and Mount Calder. No timber harvest is scheduled within these areas and roads are not permitted unless compatible with management objectives.

Stream and Lake Protection (26,207 acres)

This land use designation is intended to protect aquatic and riparian ecosystems and the species utilizing them. It is applied to lakes, riparian streamsides, and floodplains, and includes adjacent soil types subject to landslide, erosion, and windthrow hazard. The Stream and Lake Protection LUD encompasses the minimum 100-foot no commercial harvest buffer on Class I streams, and on Class II streams that flow into Class I streams, as directed by TTRA. In addition, the LUD reflects the minimum 100-foot planning level Riparian Management Area (RMA) required by the National Forest Management Act. Timber harvest is permitted within some portions of the LUD. The Stream and Lake Protection areas are included entirely within other LUD's.

Beach Fringe and Estuary (15,054 acres)

Beach Fringe and Estuaries are to be managed in a natural state favoring wildlife, fish, visual, and recreational resources. Included are areas within 500 feet of beaches and within 1,000 feet of estuaries, both measured from mean high tide. Commercial timber harvest is not allowed. These areas are included entirely within other LUD's.

1996 TLMP Draft Revision

The Revised Supplement to the Draft Environmental Impact Statement, Proposed Revised Forest Plan, (1996 TLMP Draft Revision) was released in April 1996. The Preferred Alternative, Alternative 3 with modifications, is based on the Alternative P of the TLMP Draft Revision (1991a). The 1996 TLMP Draft Revision proposes management consistent with that described above for the TLMP Draft Revision (1991a), including the same land use designations, beach fringe and estuary protection, an average timber stand rotation of 100 years, a two-aged timber harvest system where conditions allow, and a wildlife habitat conservation strategy. The 1996 TLMP Draft Revision provides greater protection than the 1991 TLMP Draft Revision for riparian and fisheries habitat and for watersheds with high fisheries values. Specific differences between the 1991 and 1996 TLMP Draft Revisions are noted for specific resources in Chapter 3 of this EIS.

Scoping and Public Participation

Initial Scoping

The NEPA process (40 CFR 1501.7) was used to identify the scope of issues to be addressed during the environmental analysis and to identify major concerns related to the proposed action. Scoping and public involvement are ongoing processes and the following are some of the opportunities taken to invite public participation and comment. Organizations including the Southeast Alaska Conservation Council (SEACC), ADF&G Advisory Committees, native committees, school district representatives, private businesses, and community residents were contacted early in the NEPA process to assist in issue identification. Additionally, subsistence studies conducted under ANILCA requirements involved 77 interviews with residents of 17 communities and logging camps potentially affected by the proposed action (Coffman Cove, Craig, Craik Logging, Hollis, Hydaburg, Ketchikan, Klawock, Labouchere Bay Camp, Metlakatla, Whale Pass, and Wrangell). Native organizations (corporations, associations, service providers) were contacted in 5 communities (Klawock, Craig, Hydaburg, Saxman, and Ketchikan). A few meetings were also conducted with groups of interested residents, primarily in Klawock.

Public Mailing

During August 1991, the Tongass National Forest solicited input on the project from Federal, State and other public agencies, along with private-sector organizations and private citizens who had previously expressed an interest in commenting on the scope of the proposed management activity. Sixty-eight individuals and groups responded to the initial mailing.

A press conference was held on October 17, 1991 to discuss current planning projects in the Ketchikan Area of the Tongass National Forest, including the Lab Bay Project. Announcements regarding the Lab Bay Project were printed in the Ketchikan Daily News and The Island News. A public mailing also provided information about how to provide input to the Forest Service.

Notice of Intent

A Notice of Intent to prepare an Environmental Impact Statement for the Lab Bay Project was published in the Federal Register on September 6, 1991.

Internal Scoping

An internal scoping meeting between resource specialists at the Thorne Bay Ranger District occurred on December 12, 1991. Preliminary issues which emerged from this meeting were incorporated by the Lab Bay ID Team into the analysis together with other input received during the preliminary scoping process.

Following development of the preliminary unit pool and alternative frameworks which were based on public input, meetings were held with Ketchikan Area specialists (June 1992) and Thorne Bay resource specialists (July 1992) to discuss how the alternatives addressed project issues and concerns.

Ongoing Public Involvement

During the course of the summer 1992 field investigations, meetings were held with representatives of affected organizations, including the Southeast Alaska Conservation Council (SEACC), Greenpeace and Ketchikan Pulp Company, as well as individuals in Labouchere Bay, Port Protection, Whale Pass, and Point Baker to further solicit public input. In September 1992, a notice identifying the specific harvest units under consideration for inclusion in the alternatives was posted in the communities of Port Protection and Whale Pass, and the Labouchere Bay logging camp, requesting specific comments on the units and/or areas under consideration. Public input received in response to the notice was used by the ID Team in the process of refining alternatives.

Following completion of the 1992 field investigations, a Project Update was prepared, summarizing progress to date. This update and a map were sent to the Project mailing list in December 1992, and a news article was published in the Ketchikan Daily News. Analysis of the alterna-

tives and publication of the Draft EIS was delayed in late 1993 in order to more thoroughly examine karst resources in the Project Area. This work and how it is being incorporated into the analysis was described in the November 1994 Project Update provided to the mailing list. Also, during November 1994, Project update meetings were held in Port Protection/Point Baker, Whale Pass, Coffman Cove, Thorne Bay, and Ketchikan. A Project Update describing each alternative framework was distributed in April 1995. Copies of the Project Updates and maps are available as part of the Project Planning Record.

Periodic contact and consultation has been maintained with the following organizations and agencies: Alaska Departments of Fish and Game, Natural Resources, and Parks; U.S. Fish and Wildlife Service; National Marine Fisheries Service; and the Sealaska Corporation.

Information meetings were held with State and Federal agencies during preparation of the Final EIS. Ketchikan Area, Thorne Bay Ranger District, and contractor personnel met with the U.S. Fish and Wildlife Service in Ketchikan on December 12, 1995 to discuss the Draft EIS. A Coastal Zone Management Plan consistency meeting was held with the Alaska Department of Fish and Game and Alaska Department of Environmental Conservation on April 29, 1996 in Ketchikan.

In the course of the subsistence studies conducted concurrently for the Project under ANILCA requirements, 77 interviews were conducted with residents of the following communities and logging camps:

Coffman Cove	Ketchikan	Naukati	Thorne Bay
Craig	Klawock	Petersburg	Saxman
Craik Logging	Labouchere Bay	Point Baker	Whale Pass
Hollis	Metlakatla	Port Protection	Wrangell
Hydaburg			

Public Comments and Hearings

Availability of the Draft EIS was announced in the Federal Register on August 4, 1995 with the deadline for public comment listed as September 18, 1995. The comment period was subsequently extended to September 30, 1995 to allow for additional public input. Copies of the Draft EIS were mailed to all individuals and organizations on the Project mailing list. Notices of the availability of the Draft EIS and announcing the schedule for subsistence hearings and public open houses were placed in the *Ketchikan Daily News* and the *Island News*. Additional notices to radio stations and newspapers in the region were issued.

ANILCA subsistence hearings and open houses were held on the dates and in the communities listed below. Open houses were held in conjunction with the subsistence hearings to describe the analysis process and answer public questions on the Draft EIS. Public comment on the Draft EIS was also accepted at that time.

Community	Date	Meeting Type
Port Protection/Point Baker	August 17, 1995	Open House
Whale Pass	August 17, 1995	ANILCA Hearing
Thorne Bay	August 18, 1995	Open House
Klawock	August 19, 1995	ANILCA Hearing
Craig	August 19, 1995	ANILCA Hearing
Coffman Cove	August 21, 1995	ANILCA Hearing
Wrangell	August 22, 1995	ANILCA Hearing
Ketchikan	August 23, 1995	Open House
Port Protection/Point Baker	September 22, 1995	ANILCA Hearing

Approximately 42 individuals, organizations, and agencies submitted written comments on the Draft EIS. In addition, public comments made during ANILCA hearings and open houses were incorporated into the Final EIS. Responses to comments were prepared and are presented in

Appendix O of this EIS. The Final EIS has been filed with the Environmental Protection Agency and is available to the public.

Issues

Analysis of the proposed land use action in the Lab Bay Project Area has been built upon a number of issues identified during scoping consultation with members of the public, government agencies, and Forest Service. Each issue was analyzed by the ID Team to determine the effect the proposed action would have on the overall management and environment of the Lab Bay Project Area as well as any direct and indirect effects on resource values and uses. This process focused the analysis on eight broad issue areas determined to be significant and within the scope of this EIS. Alternative frameworks were then constructed around these issues, and the environmental consequences of the alternatives were analyzed. Issues 1 through 8 below were part of one or more alternative frameworks, while issues A through E were considered but determined to be outside of the scope of this EIS.

Issues Addressed in This EIS

Issue 1: How will the harvest of 85 million board feet of timber from the Lab Bay Project Area affect the future supply and availability of timber?

The public expressed concern about the amount of timber available and proposed for harvest. Some respondents would prefer to see all merchantable timber harvested in a short time period, while others prefer a reduced level of harvest. This issue also includes the public concern about the types of harvest methods being used and the balance between timber harvest and other forest uses. Compliance with TTRA's proportional harvest requirement was also sought by individuals.

Issue 2: How would timber harvest affect subsistence resources and use within the Project Area?

For many area residents, subsistence hunting, trapping, fishing and gathering natural resources provides needed food. For others, especially Southeast Alaska's Native Americans, subsistence is a life-style that preserves traditional customs and values. The effects of harvesting timber and constructing roads is a concern to subsistence users whose traditional hunting, trapping and gathering areas may be changed by this action. Increased access and habitat fragmentation could reduce the habitat capability of the Project Area and could disperse the animals from traditionally used areas, altering subsistence opportunities. Increased competition from nonsubsistence users is a directly related concern. Conversely, some subsistence users benefit from the improved access that new or improved roads provide.

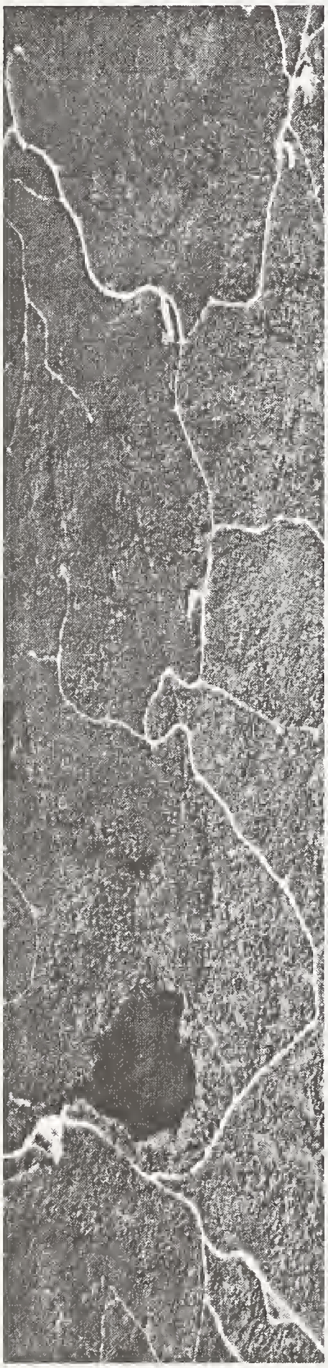
Issue 3: What effects would timber harvest and related activities have on wildlife habitat and biological diversity?

The Project Area supports a wide variety of wildlife species. The habitat requirements of many of these species are associated with mature forest stands and must be integrated with timber harvest planning. Consideration must be given to the fragmentation of large blocks of old growth, to biological diversity, and to species dependent upon this habitat. Miles of open road within the Project Area also affect wildlife species, particularly when habitat becomes more fragmented. This action is proposed within the possible ranges of several threatened, endangered or sensitive species. Respondents expressed a desire to see timber harvest managed in such a way as to protect these species and their recovery plans. Some specific concerns expressed included maintenance of previously mapped old-growth retention and extended rotation areas.

Issue 4: What effects would timber harvest and road construction have on fish habitat and water quality?

Streams and the adjacent habitat provide important spawning, rearing and shelter areas for both resident and anadromous fish. Marine waters support shellfish and saltwater species of fish.

Some respondents stated that these resources should be protected, in particular in the erosion-prone Salmon Bay Lake watershed. Other areas of concern are the watersheds surrounding the communities/logging camps of Port Protection and Labouchere Bay, in particular those watersheds that supply community drinking water. Concern was also expressed for watersheds providing water supply to private residences and the Whales Resort. Interest was expressed in managing timber harvest and road construction to protect water quality and to sustain fish populations for subsistence, commercial, and sport users.



Issue 5: What effects would timber harvest and related activities have on recreationists in or near the Project Area?

Remoteness and solitude are two of the characteristics that make the Lab Bay Project Area attractive to both residents and visitors. In contrast, the extensive road network makes Prince of Wales Island more accessible than any other island in Southeast Alaska. The Project Area offers recreation values and opportunities which include hunting, fishing, hiking and caving. Tourism is increasing, with visitors attracted by both the natural setting and its accessibility. Existing recreation developments within the Project Area include cabins at Red Lake and Salmon Bay Lake, a campground at Exchange Cove, and a picnic site at Memorial Beach. The Mt. Calder/ Mt. Holbrook and Salmon Bay Lake LUD II's provide primitive recreation opportunities. How existing recreation uses and future recreation opportunities will be balanced with timber harvest was the subject of several comments.

Issue 6: To what extent would timber harvest influence the character of the landscape and how would timber harvest be designed to protect visual quality?

The Project Area can be seen from several recreation areas and marine travel routes. The scenic forested hills and beaches provide an outstanding natural setting for both tourists and residents. Tourism is helping to diversify the regional economy, so maintaining the scenic quality of the landscape is an important regional concern. Preserving certain scenic views is recognized as an important factor in designing a timber harvest. Respondents recommended protection of views in the area of Port Protection, Point Baker, Whale Pass, Thorne Island, Salmon Bay Lake, Red Bay, and Red Bay Lake.

Issue 7: What effects would timber harvest and road construction have on local communities and residents?

The regional economy is highly dependent upon the land and its natural resources. Because of this dependency, forest management is closely tied to the issue of social and economic development and structure at the regional and community level. Both the short and long-term costs and benefits of timber-related activities must be factored into an analysis of community stability, life-style, and employment opportunities. There is disagreement among individuals and groups about the relative importance of the timber industry; some feel that the economic and social welfare is dependent on the timber, while others feel that recreation, tourism, and fisheries should be emphasized.

Issue 8: How would timber harvest affect the karst resources found in the Lab Bay Project Area?

Caves designated as significant require protection under the Federal Cave Resource Protection Act of 1988. Important and extensive cave systems and other significant features of karst have been identified throughout much of the Project Area. The term "karst" refers to a distinctive three-dimensional landform and drainage system in highly soluble bedrock, such as limestone. The caves and karstlands in the Project Area form a complex ecosystem involving hydrology, productive fisheries, high wildlife values, and high timber productivity. The cave systems are also known to shelter important cultural and paleontological resources. Within the Project Area, four areas known to contain a high density of caves have been proposed as Special Interest Areas under the TLMP Draft Revision (1991a) and the 1996 TLMP Draft Revision. Commercial timber harvest would be prohibited in these areas. Many other caves and significant features of karst exist in other locations within the Project Area. Respondents expressed concern with

nearly every aspect of the karst ecosystem, including desiring more protection of caves and cave resources, effects of harvest on the quality of domestic water supplies, impacts of harvest on the complex ecological relationships, and exploration of recreational opportunities.

Issues Outside the Scope of This EIS

Several topics were raised during scoping that are beyond the scope of the Lab Bay EIS. In some cases they are more appropriately addressed at the Forest Plan level; others are legislative concerns. These topics are:

Issue A. Harvest Should be Distributed Across Tongass National Forest

The distribution of timber harvest on the Tongass National Forest is addressed through the Forest-wide planning process and is not within the scope of decisions to be made from this project-specific EIS. The cumulative effects analyses for this project considers the influence of alternatives in relation to other timber harvest activities near the Project Area, and incorporates Forestwide cumulative impact analysis in TLMP Revision EIS documents.

Issue B. Offerings Should be Made Available to Small Business

The purpose of this project is to help meet the terms of the KPC contract in making available timber to KPC. If the selected alternative involves timber harvest, the Forest Service will determine the composition of individual offerings after the Final EIS has been completed. Offerings not selected by KPC could be made available to the Ketchikan Area independent timber sale program.

Issue C. No Further Logging on Northern Prince of Wales Island

This is an issue being addressed at the Forest Planning Level. The current land allocation for the Lab Bay Project Area emphasizes resource development outside of congressionally designated LUD II areas. The northern portion of Prince of Wales Island is also within the primary sale area for the KPC contract. The Forest Plan is currently in the process of revision and will determine future land allocations on Prince of Wales Island. Alternative 1 (no action) in this EIS will display the effects of no timber harvest from the Project Area during the operating period.

Issue D. Log Exports to Foreign Countries

Log export is a regional and national issue that exceeds the scope of this project-specific analysis.

Issue E. Below-Cost Timber Sales

Below-cost timber sales are a national issue and not within the scope of this project-specific EIS. The decision on an actual sale is a Forest management decision based on economic criteria at the time of the sale.

Legislation Related to This EIS

Below is a list of laws and Executive Orders pertaining to timber harvest and the preparation of EIS's on Federal lands. Some of these laws are specific to Alaska, while others pertain to all Federal lands.

- Alaska National Interest Lands Conservation Act (ANILCA) of 1980.
- Alaska Forest Resources and Practices Act of 1979 (as amended in 1991)
- Alaska Native Claims Settlement Act (ANCSA)
- American Indian Religious Freedom Act of 1978
- Archaeological and Historic Preservation Act of 1974
- Archaeological Resources Protection Act of 1979

- Cave Resource Protection Act (1988)
- Clean Air Act of 1970 (as amended)
- Clean Water Act of 1977 (as amended)
- Coastal Zone Management Act of 1976
- Endangered Species Act of 1973
- Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974
- Marine Mammal Protection Act of 1972
- Multiple Use Sustained Yield Act of 1960
- National Environmental Policy Act (NEPA) of 1969 (as amended)
- National Forest Management Act (NFMA) of 1976 (as amended)
- National Historic Preservation Act of 1966 (as amended)
- Native American Graves Protection and Repatriation Act of 1990
- Tongass Timber Reform Act (TTRA) of 1990
- Wild and Scenic Rivers Act of 1968, amended 1986
- Executive Order 11988 (floodplains)
- Executive Order 11990 (wetlands)
- Executive Order 11593 (cultural)
- Executive Order 12898 (environmental justice)
- Executive Order 12962 (recreational fishing)

These laws and planning documents influence the timber sale program as is described in the following examples.

- **TTRA** - The Tongass Timber Reform Act signed into law by President Bush on November 28, 1990, changed the KPC contract in several ways. These changes include:
  - Assure that all timber sale planning, management requirements, and environmental assessment procedures regarding the contracts are consistent with procedures for independent national forest timber sales;
  - Eliminate the practice of harvesting a disproportionate amount of old-growth timber by limiting the volume harvested over the rotation in Volume Classes 6 and 7 as defined in TLMP and supporting documents, so that the proportion of volume harvested in these classes within a contiguous management area should not exceed the proportion of volume currently represented by these classes within the management area;
  - Assure that all timber offered under each contract will be substantially harvested within 3 years . . . unless harvesting has been delayed by third-party litigation;
  - Assure that the price of timber offered under the contracts shall be adjusted to be comparable with that of independent national forest timber sales, with stumpage rates and profitability criteria comparable to those of independent purchasers in competitive sales;
  - Assure that timber offered under the contract meets economic criteria consistent with that of independent national forest timber sales (Public Law 101-626).
- **ANCSA** - The Alaska Native Claims Settlement Act, Public Law 92-203, 85 Stat. 688 (as amended), was enacted in 1971 to provide for the settlement of certain land claims of Alaska natives. ANCSA has been the basis for conveying selected lands under administrative jurisdiction of the Tongass National Forest to native corporations, thus making these lands un-

available to the Forest Service timber sale program. Under this Act, native corporations are entitled to 549,800 acres from the Tongass National Forest, and approximately 543,400 acres have been conveyed to them.

- **ANILCA** - ANILCA, signed into law on December 2, 1980 (Public Law 96-487), established several areas to be preserved for the benefit, use, education, and inspiration of present and future generations. Title VIII of the Act addresses the use of public lands for subsistence - the customary and traditional uses by rural Alaska residents of wild, renewable resources. Because the Project Area is located on federally managed lands, the requirements of Section 810 ANILCA must be satisfied prior to implementation of any timber harvest project.
- **CZMA** - The Coastal Zone Management Act (CZMA) of 1976 also pertains to the preparation of EIS's. While Federal lands are excluded from the coastal zone as prescribed in the Act, Federal agencies are required to conduct activities in a manner consistent with the enforceable policies of the approved State coastal management program to the maximum extent practicable. The Alaska program is contained in the Alaska Coastal Management Plan (ACMP). This plan incorporated the Alaska Forest Resources and Practices Act of 1979 as amended (1991) and applied standards and guidelines for timber harvesting and processing. The Forest Service standards and guidelines and mitigation measures described in Chapter 2 of this document are fully consistent with the State coastal zone management standards. Field verification assures that the activities proposed are consistent with the approved coastal management programs to the maximum extent practicable. The Forest Service filed its consistency determination with the State on April 1, 1996. The State concurred that the proposed action is consistent with the ACMP in its letter dated May 22, 1996.
- **Prince of Wales Area Plan** -The Prince of Wales Area Plan proposes guidelines for the management of State-owned lands within the Prince of Wales planning area (ADNR 1988). The plan describes where the State proposes to select additional lands from the Tongass National Forest, prioritizes the location and timing of future land disposals, indicates where log transfer and storage areas may be located on State tide and submerged lands, and designates areas especially important for fish and wildlife habitat and harvest. It also sets guidelines for uses that occur on State lands. No proposed Lab Bay harvest units are located on state land. Easements across state land may be required for construction of some proposed roads.

Federal and State Permits

Implementing any of the timber harvest alternatives addressed in this EIS will require that permits be obtained from other agencies. Administrative actions on these permits would take place 30 days after the Final EIS is filed with the Environmental Protection Agency. The agencies and their responsibilities which may apply to project-related actions are listed below.

Agencies and Responsibilities

U.S. Army Corps of Engineers

Approval of discharge of dredged or fill material into waters of the United States (Section 404 of the Clean Water Act).

Approval of construction of structures or work in navigable waters of the United States (Section 10 of the Rivers and Harbors Act of 1989).

U.S. Environmental Protection Agency

National Pollutant Discharge Elimination System review (Section 402 of the Clean Water Act).

U.S. Coast Guard

Coast Guard Bridge Permit (in accordance with the General Bridge Act of 1946) required for all structures constructed within the tidal influence zone.

State of Alaska, Department of Natural Resources
Authorization for occupancy and use of tidelands and submerged lands.

State of Alaska, Department of Environmental Conservation
Certification of compliance with Alaska Water Quality Standards (Section 401 Certification).

Solid Waste Disposal Permit.

State of Alaska, Division of Governmental Coordination
Certification of consistency with the Coastal Zone Management Act.

Availability of the Planning Record

Information documenting development of this EIS is available for review at the Forest Supervisor's Office, Ketchikan, Alaska. Portions of the planning record that typically are made available to the public under the Freedom of Information Act will be available for review during normal business hours.

The reader also may wish to refer to the Tongass Land Management Plan, the Tongass Land Management Plan Draft Revision (1991a), the 1996 TLMP Draft Revision, the Tongass Timber Reform Act, the Resources Planning Act, and the Alaska Regional Guide and its Final EIS. These are available at public libraries throughout the region, the Supervisor's Offices in Ketchikan, Sitka and Petersburg, and at the Regional Office in Juneau.

El Cap recreation facility

Chapter 2
Alternatives

Chapter 2
Alternatives

Key Terms

Adjacency Requirements - A Forest Plan standard that restricts the placement and sizing of new harvest units immediately next to previously harvested units until the previously harvested area has achieved the desired height growth necessary to meet resource objectives of the area.

Best Management Practices (BMP's) - Land management methods, measures or practices intended to minimize or reduce water pollution. Usually BMP's are applied as a system of practices rather than a single practice. BMP's are selected on the basis of site-specific conditions that reflect natural background conditions and political, social, economic, and technical feasibility.

GIS - Geographic Information System.

Implementation Monitoring - Collecting information to evaluate whether mitigation measures were carried out in the required manner.

Karst - A type of topography that develops in areas underlain by soluble rocks, primarily limestones. Dolines, collapsed channels, vertical shafts, and caves are formed when the subsurface layer dissolves. Areas on which karst has developed are said to display "karst topography" or are referred to as a "karst landscape".

LSTA - Logging System and Transportation Analysis - Interdisciplinary design and mapping of all potential timber harvest units, including associated logging and transportation systems.

Log Transfer Facility (LTF) - A facility that is used for transferring commercially harvested logs to and from a vessel or log raft, or the formation of a log raft.

Mitigation - Measures designed to avoid, minimize, rectify or lessen environmental impacts.

Subsistence - Customary and traditional uses by rural Alaskans of wild renewable resources.

Value Comparison Unit (VCU) - Areas that generally encompass a drainage basin to provide a common set of areas where resource inventories could be conducted and resource interpretations made.

Introduction

Chapter Two describes and compares the alternatives to the proposed action in the Lab Bay Project Area. Maps of each alternative considered in detail are included at the end of this chapter. The following information is also provided in this chapter:

- a description of the process used to formulate the alternatives;
- a description of alternatives considered but eliminated from detailed study, accompanied by reasons for elimination;

- a description of alternatives considered in detail, a comparison of the alternatives, and a discussion of how each addresses the significant issues identified for the project; and
- a description of site-specific mitigation and monitoring plans proposed for the project.

Chapter Three presents a detailed description of baseline conditions and an assessment of the environmental consequences of each action alternative on these conditions. For a detailed discussion of how each alternative affects a specific resource, readers should consult Chapter Three. Additional information is contained in the Lab Bay Planning Record, including various Resource Reports which present the results of field work and analysis conducted for this project.

Changes between Draft EIS and Final EIS

New Information

Additional site-specific information about the Lab Bay Project Area has become available since the publication of the Draft EIS. New information resulted primarily from supplemental field studies on the Lab Bay Project, but also included data from Thorne Bay District and Ketchikan Area studies. The recently published 1996 TLMP Draft Revision (USDA Forest Service 1996) provides new information and recommendations proposed for incorporation into the Forest Plan. Sources and types of new information include the following:

- Supplemental stand exam data for 54 proposed harvest units
- Surveys for northern goshawks on 48 proposed harvest units
- Supplemental field verification of karst vulnerability on proposed harvest units and roads
- Surveys for threatened, endangered, and sensitive plants
- Supplemental field assessment of visuals resources affected by proposed harvest units
- Implementation of road closures in Calder Bay area
- Ketchikan Area Update and revised Appendix A
- Updated timber supply information
- 1996 TLMP Draft Revision and supporting documents
- Revised Habitat Capability Model for Sitka black-tailed deer (Appendix P)

The new information is reflected in revisions to the Final EIS text and analyses, as described below.

Public Input

Public input on the Draft EIS included comments received at ANILCA subsistence hearings, other public meetings, and written comment letters. Appendix O, Public Comment and Responses, has been added to the Final EIS. Specific concerns regarding subsistence, wildlife, and visuals effects led to development of a new alternative, Alternative 6, for the Final EIS. (Alternative 6 is a subset of the full harvest unit pool, Alternative 2, and as such does not require an additional public comment period.) Public comment on the Draft EIS led to revision and clarification of sections of the Final EIS as described below.

Revised Analysis

Discussion of the effects of a new alternative, Alternative 6, was added to Chapter 3 of the Final EIS.

New information and public input is reflected in revisions to text and tables in many sections of the Final EIS. The major revisions are described below by resource area. Unit cards that were revised substantially are presented in Appendix G.

In some cases, new information caused a change to unit or alternative design that resulted in a lessening of environmental effects. Environmental consequences were not reanalyzed for resources that would receive lesser impacts as a result of these changes. Examples of this type of change include the following: one unit was dropped from all alternatives due to low inventory volume;

one setting was dropped due to soil stability concerns; and buffers were widened to a minimum of 100 feet on streams adjacent to two units. These changes are described in the following section.

Silviculture, Timber, and Vegetation

- Harvest volumes were revised for all alternatives based on 1995 supplemental stand exam data.
- Harvest type was revised from Type E (overstory removal) to Type F (shelterwood) for Unit 540-210 based on field inventory; retention percentage remained the same; unit card and map were revised.
- Unit 531.1-242 was dropped from Alternatives 2, 3, 4, and 5 due to low timber inventory volume; environmental consequences were not revised, with the exception of volume-based analyses as described above.
- The south setting in Unit 535-208 was deferred due to soils instability; environmental consequences were not revised, with the exception of volume-based analyses described above.
- Timber supply analysis revised to incorporate new information from Ketchikan Area Update, 1996 TLMP Draft Revision, and revised Appendix A.

Soils and Water

- Discussion of risk of soil mass movement and expected effects of implementation of BMP's were clarified in text.

Wildlife, Old Growth and Biodiversity

- Habitat Capability Models were reanalyzed for black-tailed deer, black bear, and gray wolf.
- Habitat Capability Models for all species presented as a relative index of habitat capability, rather than as estimated population numbers.
- Results of revised deer Habitat Capability Model incorporated into analysis. (Results presented in Appendix P.)
- Alternative 6, emphasizing protection of high value wildlife and subsistence use areas, was developed in response to public comment.
- A project-specific strategy for management of contiguous old-growth areas was developed for Alternative 6.
- The proposed road access management plan was revised to incorporate new road closures and deferral of harvest on units in Calder/El Capitan vicinity; open road densities were not revised, but will be less.

Threatened, Endangered and Sensitive Species

- Appendix N, Biological Assessment/Biological Evaluation, was prepared for the Final EIS.

Transportation, Logging, and Facilities

- Logging costs were updated based on revised volume estimates.
- Additional information on LTF permitting was provided.
- Alternative 6 was developed in response to public comment, and does not include the Calder Tie Road.

Riparian Areas and Fish

- Discussion of stream classes was revised to incorporate recent Forest Service direction; stream buffers were widened to a minimum 100 feet on two Class II streams adjacent to Units 528-250 and 540-206; projections of environmental consequences were not revised but potential risk and effects will be less.

- Discussion of Riparian Management Areas (RMA's) along high gradient contained stream channels was revised to clarify that retention of trees within RMA must be in accordance with protection of water quality and prevention of windthrow; specific unit cards were revised to clarify RMA management direction.

Visuals and Recreation

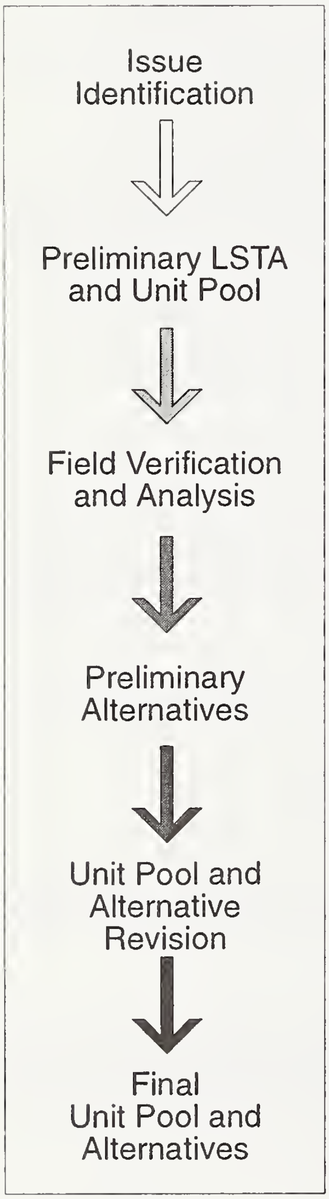
- The Final EIS incorporates results of additional fieldwork along the Cruiseship Route and West Coast Waterway, particularly the areas near Red Bay, Thorne Island, and Whale Pass; environmental consequences section and unit cards were revised to reflect new information.

Subsistence

- Public input was used to develop Alternative 6, which places emphasis on protection of high use subsistence areas.
- Subsistence analysis revised to incorporate use of habitat capability results as a relative index, and to reflect additional analysis of revised deer model (Appendix P).

Karst

- Supplemental field work was performed to verify vulnerability classification of karst landscape within and adjacent to proposed harvest units and roads.
- A second alternative (Alternative 6) emphasizing protection of high vulnerability karst features was developed.
- Specific mitigation measures for protection of karst resources were refined in unit and road cards.



Socio-Economics

- Economic analysis was updated with revised harvest volume information and updated cost information.
- The mid-market analysis was revised and a current value analysis was added.
- Socio-economic impacts were reanalyzed with additional information on local economies.

Chapter 2

- A summary of effects of Alternative 6 was added.
- In response to public comment, the Chapter 2 discussion of relationship of project-specific monitoring to Tongass National Forest and Ketchikan Area monitoring plans was expanded.

Appendices

- Appendix A was revised for the Final EIS to present the latest projections of demand for timber supply and KPC contract volume needs, and it addresses the projected need for timber from outside the primary sale area. The updating of the appendix A information does not result in a different conclusion regarding the purpose and need for the Lab Bay Sale.
- Appendix F, Unit Design Cards, was revised to reflect refinements in unit design; only those cards with substantial design or implementation changes are included in the Final EIS Appendix. All other unit cards are incorporated from the Draft EIS by reference.
- Appendix H, Road Cards, was revised to provide additional information on road access management, stream crossing structures, and karst mitigation measures. All road cards are reprinted in the Final EIS Appendix.
- Four new appendices were added to the Final EIS: Appendix N, Biological Assessment/ Biological Evaluation; Appendix O, Public Comment on Draft EIS and Forest Service Response; Appendix P, Revised Deer HCM; and Appendix Q, Units of Economic Concern.

The changes to these sections are not so substantial in light of environmental concerns or range of alternatives as to require supplementation of the EIS.

Development of Alternatives

Each action alternative presented in this EIS is a different approach to meeting the purpose and need for action while addressing the issues identified in Chapter 1. Five action alternatives were developed after extensive data analysis and field verification by the Interdisciplinary Team (ID Team) of resource specialists. The process used to develop the alternatives included the following steps:

1. Identification of the key issues described in Chapter 1.
2. Development of a set of preliminary alternative frameworks, based on and responsive to, these issues and the purpose and need for action.
3. Development of a preliminary Logging System and Transportation Analysis (LSTA) and a preliminary pool of potential harvest units and associated roads which meet Forest Plan standards and guidelines and are consistent with TLMP Draft Revision (1991a) standards and guidelines, through use of maps, 1991 aerial photographs and available GIS data.
4. Field verification of the suitability of timber, logging feasibility, and associated resource constraints and opportunities for each potential harvest unit and proposed road.
5. Analysis of unit-specific field data and revision of the unit pool and alternatives to better address the project issues and concerns and to meet Forest Plan objectives.
6. Development of a preliminary set of reasonable alternatives, assigning harvest units to the appropriate alternative framework.
7. Finalizing of the unit pool and alternatives to respond to current Forest-wide management direction.

Preliminary Planning

Issues identified during public scoping for the Lab Bay Project were analyzed by the ID Team. Those issues were categorized according to whether they would most appropriately be addressed: 1) by land use allocation at the Forest Plan level; 2) by applying Forest Plan standards and guidelines; 3) by imposing resource-specific mitigation measures; 4) through assignment of proposed harvest units to alternatives; 5) as the basic framework of an action alternative; or 6) by evaluating the effects that would result from implementation of the alternative. Issues that were categorized as types 4) or 5) were used to create the framework for the action alternatives. The remaining issues were consolidated into 8 significant issues. Issues such as land allocations were determined to be outside the scope of this EIS. The effects of each alternative on the eight significant issue areas are summarized later in this chapter.

As scoping issues were defined, logging engineers worked with resource specialists to develop a preliminary logging system and transportation analysis (LSTA). This analysis made use of existing Forest Service GIS information, topographic maps, and aerial photographs. Previously developed maps of commercial forestland were examined to determine which lands could be classified as tentatively suitable for harvest under the TLMP Draft Revision (1991a). Next, potential timber harvest units and supporting road networks were mapped for all suitable and available commercial forestland.

Based on the preliminary LSTA, ID Team members identified units that could be harvested at this time, consistent with Forest-wide standards and guidelines. The major factors limiting the number of potential harvest units at this stage of analysis were adjacency, cumulative watershed harvest, and cumulative visual disturbance requirements under the TLMP Draft Revision (1991a). The ID Team evaluation of the preliminary LSTA resulted in a preliminary unit pool of 181 harvest units covering an area of approximately 8,000 acres with an estimated usable timber volume of 180 million board feet.

Field Verification and Analyses

From June through September of 1992, teams of logging engineers. foresters, wildlife and fisheries biologists, visual/recreation specialists, archaeologists, karst geologists, and hydrology/soils specialists performed a field resource inventory for each potential harvest unit, adjacent areas, and associated roads. Field teams were cross-trained in the natural resource disciplines. Preliminary road locations, unit boundaries, and protective buffers were flagged. Existing constraints and opportunities related to each resource were recorded for each harvest unit and road identified in the pool of units. Measures to protect and improve resource values were identified and management prescriptions were developed to assure adherence to all Forest-wide standards and guidelines.

Upon completion of the field inventory, the ground-verified pool of units was further refined. Results of resource analyses were used to test individual units and groups of units within VCU's, watersheds, and/or viewsheds against Forest Plan objectives and Forest-wide standards and guidelines. Field data were used to update the GIS data base from which the preliminary unit pool had been developed. As a result of this process, significant changes occurred in the amount of riparian and estuary buffers in the Project Area and the amount of past harvest by watershed.

Through field and office evaluation, the boundaries of many units were adjusted and harvest methods were specified to protect or enhance identified resource values. Some units were dropped from the unit pool due to the presence of very high hazard soils, TTRA stream buffers, estuary buffers, or other constraints on suitability for harvest. Other units, including those not currently meeting adjacency or proportionality requirements, were deferred from harvest at this time. BMP's were specified to protect resource values, and site-specific mitigation was designed as needed for the remaining units.

Preliminary Alternatives

Preliminary alternatives were developed by the ID Team in the fall of 1992 at the completion of the field season. In addition to the no action alternative, five action alternatives, B through F, were developed. These were fully described in the December 1992 Project Update that was distributed to all those on the Lab Bay Project mailing list (see Planning Record).

Unit Pool and Alternative Refinement

The five preliminary alternatives were reviewed by Forest Service technical and management staff. The unit pool, unit design, and preliminary alternatives were revised in response to five primary factors, as described below.

Purpose and Need Volume

Alternatives were revised to meet as closely as possible the 85 MMBF volume included in the purpose and need for the Project, while responding to public issues and meeting the framework of the alternative.

TTRA Proportionality Requirement

The unit pool and action alternatives were revised to assure compliance with the TTRA proportional harvest requirements for Management Areas K01, K02, and K03. As a result of these recalculations, 27 units, totalling approximately 1,070 acres, were deferred from the unit pool.

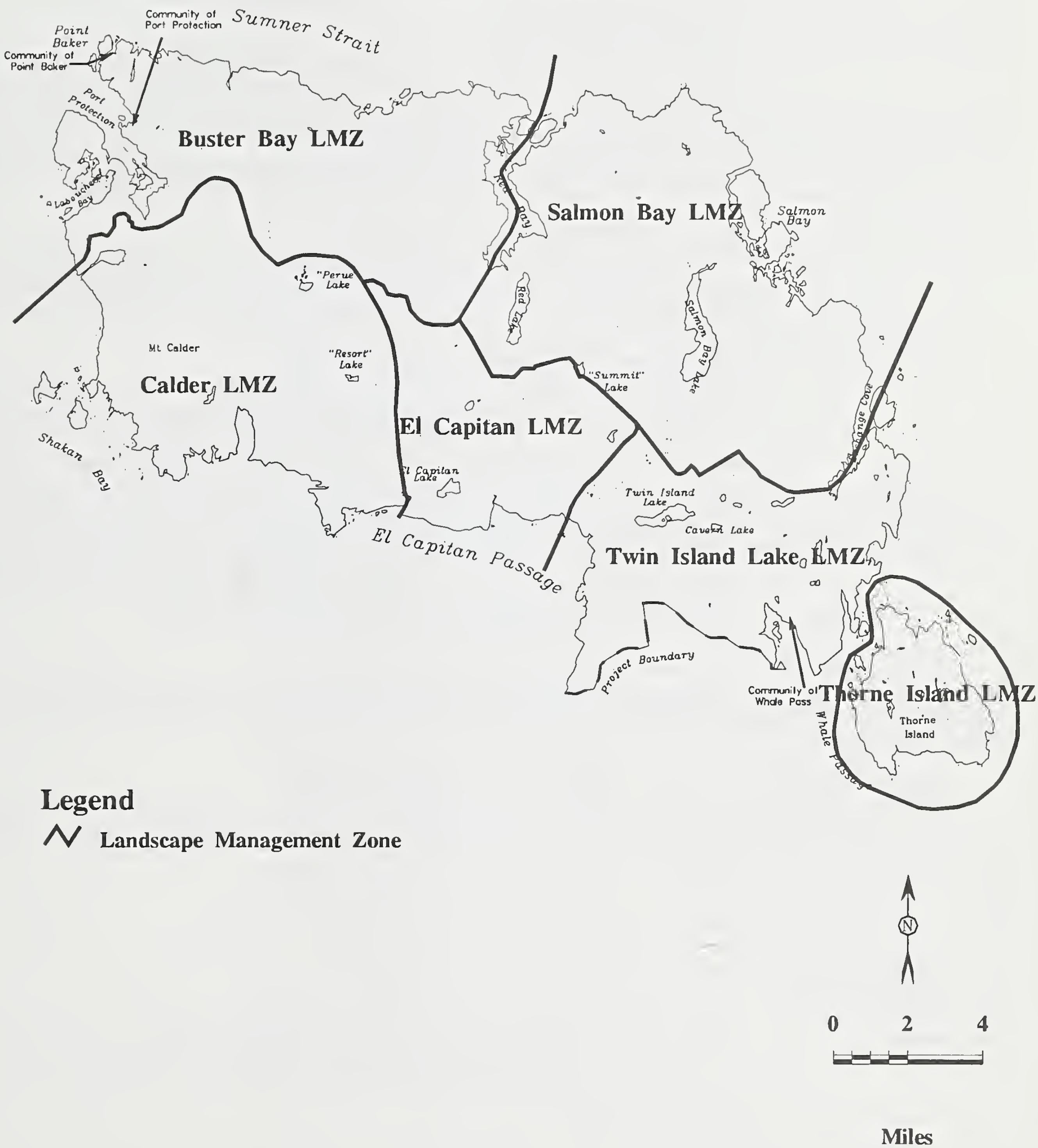
Karst Resources

Karst resources on Prince of Wales Island and the Lab Bay Project Area received increasing attention after completion of the field inventory. Additional field studies were undertaken to more fully assess the extent and the vulnerability of karst resources to harvest activities. In response to the public and scientific interest in karst resources, Phase 1 and 2 karst vulnerability assessments were conducted on the Project Area during 1994. As a result, an action alternative was designed to avoid harvest on high vulnerability karst areas.

Ecosystem Management

Ecosystem management has become an important planning tool for the National Forests. The Lab Bay Project Area was divided into six geographic areas (landscape management zones) that encompass special functions and values for one or more key resources (Figure 2-1). In addition, nine

Figure 2-1
Landscape Management Zones (LMZ's)



Source: Ketchikan Area GIS

harvest types, ranging from clearcut to single tree selection, were developed to address standards and guidelines for visual quality, water quality, fisheries, karst resources, and snag and green tree retention. Selection of a treatment was based on site-specific information, LUD, and landscape management zones. (See Appendix D for detailed descriptions of harvest types.)

Conservation Strategies

In order to support the maintenance of viable populations across the Forest landscape, several conservation strategies have been incorporated into the action alternatives. Alternatives 3 and 6 avoid harvest within proposed Habitat Conservation Areas (HCA's) from the Draft Interim Guidelines for maintenance of viable populations (USDA Forest Service 1994b); Alternatives 4 and 6 propose maintenance of large, contiguous old-growth areas and connecting travel corridors; and Alternatives 2 and 5 implement the LUD strategy proposed in the TLMP Draft Revision (1991a).

Supplemental Fieldwork

During fall of 1994 and summer of 1995, supplemental fieldwork was performed on the Lab Bay proposed harvest units. This work included additional stand exams, goshawk surveys in high quality goshawk habitat, and threatened, endangered, and sensitive plant species surveys.

Unit Pool Adjustments

Table 2-1 summarizes adjustments made to the unit pool during preliminary planning activities, field verification, and analysis phases. Dropped units are those located on unsuitable lands, and are recommended for removal from the suitable timber base. Deferred units are those which either require field verification regarding suitability, or have been field verified as suitable but unavailable for harvest at this time due to various standards and guidelines. The table indicates the primary reason for dropping or deferring a unit; in many cases additional resource concerns contributed to the decision. As shown on the table, the primary reasons for deferral of harvest were proportionality (27 units), adjacency (14 units), logging feasibility/cost (10 units), and cumulative visuals and watershed concerns (5 units each). Units were dropped (as opposed to deferred) primarily due to stream (TTRA) and estuary buffer requirements (9 units).

Table 2-1
Number of Units Dropped or Deferred From Analysis During Paper Plan Development and Field Evaluations

	Logging Feasibility / Cost	Stream & Estuary Buffer	Adjacency Requirement	89-94 Contingency Unit	Visual Quality	High Hazard Soils	State Selection (Proposed)	Cumulative Watershed	Silvicultural Limits	Proportionality
Total	10	9	14	1	5	1	2	5	2	27

Note: Some units may have multiple reasons for being dropped/deferred. These are presented in Appendix B.

Final Unit Pool and Alternatives

The current Lab Bay unit pool is comprised of 125 field-verified harvest units on approximately 4,550 acres. Approximately 78 miles of new road would be required to access the units; 24 units are designed for harvest by helicopter. Harvest of the unit pool would result in approximately 101 MMBF of timber volume. Alternative 2 encompasses the full unit pool. Other action alternatives are subsets of the pool.

Management Direction Common to All Actions

Management direction common to each alternative framework is described below.

- Each action alternative considered for detailed study meets the stated purpose and need for the project as closely as possible, while responding to public issues and meeting alternative frameworks.

- Each action alternative complies with Forest planning documents, including the 1990 Resources Planning Act, the Alaska Regional Guide, the TLMP (1979, as amended), and the TLMP Draft Revision (1991a). Alternatives are consistent in general with the management activities proposed in the Preferred Alternative of the 1996 TLMP Draft Revision.

- Each alternative complies with Section 301(c)(2) of the Tongass Timber Reform Act (TTRA), which modified the KPC contract to:

  "eliminate the practice of harvesting a disproportionate amount of old-growth timber by limiting the harvest over the rotation in volume classes 6 and 7, as defined in TLMP and supporting documents, so that the proportion of volume harvested in these classes within a contiguous management area does not exceed the proportion of volume currently represented by these classes within the management area;"

- Each alternative complies with Section 103(a) of TTRA which states that the Forest Service shall:

  "...maintain a buffer zone of no less than one hundred feet in width on each side of all Class I streams in the Tongass National Forest, and on those Class II streams which flow directly into a Class I stream, within which commercial timber harvesting shall be prohibited..."

- Each alternative is consistent with the standards and guidelines of Alternative P of the TLMP Draft Revision (1991a), including:

  - No harvest units will be placed within either the 500-foot shoreline buffer or the 1,000-foot estuary buffer except for Alternatives 4 and 6 which propose an uneven-aged management plan for Thorne Island. This plan proposes small patchcuts averaging 2 acres in size, within the beach fringe. See Appendix E for a detailed description of this plan.

  - Each individual unit meets the standards and guidelines for riparian management.

  - Collectively, all alternatives meet the objective to provide sufficient habitat to contribute to the maintenance of viable populations of wildlife species.

  - All units and roads will meet the adopted visual quality objectives (VQO's).

- Each Alternative is consistent, in general, with the standards and guidelines proposed in the recently published 1996 TLMP Draft Revision, Preferred Alternative, which is based on Alternative P of the 1991 Draft Revision.

- Individual harvest units that exceed 100 acres comply with current regional direction in the Alaska Regional Guide which states that:

  "...100 acres is the maximum size of created openings to be allowed for the hemlock-Sitka spruce forest type of coastal Alaska, unless excepted under specific conditions. "

  "Recognizing that harvest units must be designed to accomplish management goals, created openings may be larger where larger units will produce a more desirable contribution of benefits."

The exterior boundaries of two proposed harvest units exceed 100 acres in size. Neither of the units exceed 150 acres. Mitigation measures have been prescribed and will be applied during final unit layout to reduce the size of the created openings to below 100 acres. Mitigation includes adjustment to unit boundaries, selective harvest over part of the unit, or retention of buffer strips to reduce the effective size of the created opening to approximately 100 acres. Therefore these units do not exceed the 100-acre opening guideline. Each unit and its mitigation measures are described in Chapter 3 and Appendix F.

- Ecosystem management principles were incorporated into all alternatives through designation of harvest types. A harvest type was designated for each proposed harvest unit and generally does not vary by alternative. These include:
  - retention of snags in harvest units, consistent with safety regulations.
  - retention of individual live reserve trees or patches of live reserve trees in harvest units.
  - application of selective tree harvest systems to maintain visual quality and wildlife habitat.
  - use of overstory removal harvest to maintain a vigorous understory.
  - maintenance of large down logs in harvest units.
  - silvicultural treatment of second growth to enhance wildlife habitat.

Alternatives Considered but Eliminated from Detailed Analysis

Preliminary Alternative B

Preliminary Alternative B was designed to harvest the maximum volume the Project Area can provide at this time. It included 181 harvest units and would provide approximately 180 MMBF of timber. It was not considered in detail because it harvested a disproportionate amount of Volume Class 6 and 7 timber in Management Areas K02 and K03 and would not assure compliance with the TTRA proportionality requirement. Final Alternative 2, the unit pool, is based on Alternative B with high volume class units in MA's K02 and K03 deferred from harvest at this time.

Preliminary Alternative D

Preliminary Alternative D, which emphasized timber-related economic benefits, did not meet mandated proportionality requirements and, in addition, did not show a clear economic superiority over other alternatives. This alternative was dropped from further consideration.

Alternatives Considered in Detail

Six alternatives, including one No Action alternative, are considered in detail in Chapter 3. The effects of each alternative upon eight key issues identified during public scoping are described in the following pages. Table 2-3 summarizes the consequences of the alternatives. The alternatives, including the No Action Alternative, are displayed on the fold-out maps at the end of Chapter 2.

Alternative 1 represents the existing condition of the Project Area and its adoption would not implement any of the actions described in this document. This is the "no action" alternative against which all others are compared.

Alternatives 2, 3, 4, 5, and 6 represent different means of achieving the project purpose and need while responding to the public issues with differing emphasis.

Alternative 1 (No Action)

Framework

Alternative 1 proposes no new timber harvest, road construction, or road closures in the Project Area. This alternative is the baseline against which the effects of all other alternatives are measured.

Resource Outputs

There are no new resource outputs associated with this alternative. Timber harvest and road building would not occur within the Project Area. Additional receipts to the State of Alaska would be foregone, existing jobs would not be sustained, and no new jobs would be created.

Environmental Consequences

A summary of the environmental effects of implementing Alternative 1 is presented below.

- *Issue 1: Timber*
  Because there would be no timber supplied to the local and regional markets from this Project Area, TTRA proportionality would remain at the current levels of 0.20, 0.98 and 0.87 percent less, respectively, than the TTRA baseline for Management Areas K01, K02 and K03. The current timber supply in the Lab Bay Project Area would be unaffected.

- *Issue 2: Subsistence*
  Subsistence use of the Project Area would not be directly affected under Alternative 1. No further timber harvest or road construction would occur in areas which support subsistence use. However, there is a significant possibility of a significant restriction of subsistence use of deer, black bear, and otter occurring in the future. Direct and cumulative effects of past timber harvest activities in and surrounding the Project Area will continue to affect subsistence activities for several communities and may require mitigating measures such as road closures or the restriction of nonrural hunters as early as 2004. This will almost certainly be required by 2040. Deer is the main resource of concern in two of the Project Area WAA's 1528 and 1530. Otter habitat capability is of concern in WAA 1527.

- *Issue 3: Wildlife and Biodiversity*
  All effects on habitat and biodiversity would be avoided except those resulting from natural factors such as plant succession. No new roads would be constructed and existing roads would not be improved or degraded as a result of Alternative 1. Road closures to protect wildlife habitat and subsistence use areas would not be implemented.

- *Issue 4: Fish Habitat and Water Quality*
  Fish habitat and water quality would not be affected by new timber harvest or road construction.

- *Issue 5: Recreation*
  Recreation opportunities would be unchanged with the implementation of Alternative 1. Much of the Roaded Modified ROS setting would gradually change to more natural appearing settings, such as Roaded Natural and Semi-Primitive Motorized categories, with the cessation of timber activity and the maturation of second growth.

- *Issue 6: Visuals*
  Visual quality would be unchanged in the Project Area. Previously harvested areas would gradually change to more natural appearing conditions over time.

- *Issue 7: Social and Economic Factors*
  No economic return to the State of Alaska from timber harvest revenues would occur. Because timber currently is not being harvested in this area, jobs could not be lost or created as a result of implementing this alternative. Indirect effects would result from less timber transported, supplied to mills or shipped out of state. Timber-related jobs would not be created or sustained in the Project Area.

- *Issue 8: Karst*
  Under Alternative 1, caves and other significant karst resources would be unaffected by new road development or timber harvest.

Alternative 2

Framework

Alternative 2 includes all proposed units that are feasible to harvest at this time under federal and state laws and forest-wide standards and guidelines.

Resource Outputs

Implementation of Alternative 2 would result in the harvest of approximately 101 MMBF of timber from 125 harvest units. This volume would be harvested from approximately 4,550 acres and includes 18 MMBF of timber from the clearing for approximately 78 miles of new road. One new Log Transfer Facility would be constructed for the proposed harvest on Thorne Island. Payments to the State of Alaska are estimated at $4.8 million and approximately 156 direct jobs would be supported during year three of an estimated 4-year harvest period.

Environmental Consequences

A summary of the environmental effects of implementing Alternative 2 is presented below.

- *Issue 1: Timber*
  Approximately 101 MMBF of timber would be made available for harvest under this alternative. The resulting change in proportion would be -0.14, -0.14, and +0.19 percent above or below the TTRA Base (November 28, 1990) high volume class timber proportion for Management Areas K01, K02, and K03. The proposed harvest would increase the high volume proportion in each Management Area in comparison with the No Action Alternative.

- *Issue 2: Subsistence*
  Alternative 2 may result in a significant restriction of subsistence use of Sitka black-tailed deer for the residents of Coffman Cove, Craig, Klawock, Wrangell, Point Baker, Port Protection, and Whale Pass. Effects would be pronounced for residents of the latter three communities. Subsistence use of black bear may be restricted in WAA 1527 if the pattern of harvest by nonrural hunters continues as access increases. This effect would increase if the Calder Tie Road were constructed. Additionally, the effects of current conditions described in Alternative 1 are applicable.

- *Issue 3: Wildlife and Biodiversity*
  Under this alternative, 4,194 acres of old-growth habitat would be harvested. This represents approximately 5 percent of the total remaining old growth in the Project Area. In addition, 391 acres are riparian habitat. Road construction would result in the harvest of an additional 233 acres of old-growth habitat, 98 acres of riparian habitat, and 7 acres that are within Beach Fringe and Estuary. Seventy-eight miles of road construction and 8 miles of reconstruction are proposed under this alternative, 81 miles of which would be closed after completion of harvest. The new Log Transfer Facility on Thorne Island would result in additional habitat disturbance for those species using the waters and beach fringe near the site.

  The number of 500-1,000 acre old-growth patches would be reduced from six to four under Alternative 2, and 100-500 acre old-growth patches would be reduced from 25 to 24. Additionally, these patches of old-growth habitat, while remaining within the same size category, would have increased fragmentation within their boundaries. Harvest would occur within the Habitat Conservation Areas (HCA's) defined in the 1994 Draft Interim Habitat Management Guidelines EA (hereafter referred to as Draft Interim - designated HCA's). Harvest would also occur within Project-defined contiguous old-growth areas (COGA's) and corridors.

  This direct loss of habitat and the increase in fragmentation would result in no change (black bear, river otter, and bald eagle) to a 6 percent (hairy woodpecker) decrease in wildlife habitat capability over current conditions within the Project Area. Black-tailed deer habitat capability would be reduced by 2.1 percent over current conditions. Threatened or endangered species would not be affected.

- *Issue 4: Fish Habitat and Water Quality*
  Timber harvest or road construction would occur within or adjacent to 3 watersheds supplying domestic water to Port Protection and the Whales Resort area. There would be approximately 1,781 acres harvested and 26 miles of road constructed on slopes with high potential for direct

or indirect delivery of sediment to a Class I stream. One watershed currently exceeding the High Gradient Contained (HGC) channel type cumulative harvest threshold would receive additional harvest. Harvest within three other watersheds would exceed the HGC threshold. Retention of wind-firm timber within the HGC zone is proposed to mitigate these effects. Road construction and reconstruction would require 28 stream crossings that are recommended to receive timing restrictions in order to minimize effects on fish resources.

- *Issue 5: Recreation*
  Alternative 2 would shift 33,854 acres from Semi-Primitive Nonmotorized, Primitive, Semi-Primitive Motorized, and Roaded Natural recreational use to Roaded Modified uses.

- *Issue 6: Visuals*
  Alternative 2 includes 42 harvest units that would be visible from Priority Travel Routes and Use Areas. Thirteen of these units would be seen from more than one Priority Travel route and Use Area. No visible harvest would occur in landscapes with an adopted VQO of Retention. Harvest would be visible in areas of Partial Retention, Modification, and Maximum Modification VQO's. The Log Transfer Facility proposed on Thorne Island would not meet the adopted Partial Retention VQO for the duration of its use.

- *Issue 7: Social and Economic Factors*
  Although a consistent supply of timber and associated jobs could continue in the near term under this alternative, long-term timber supplies would be less, resulting in a smaller future work force. The Project Area TSPIRS analysis reflects a potential net gain from timber harvest of $6.4 million, while the Present Net Value shows a gain of $4.1 million under this alternative.

- *Issue 8: Karst*
  Alternative 2 includes 1,314 acres of harvest on karstlands, of which 1,068 acres are rated high vulnerability. Approximately 11 miles of road would be constructed across high vulnerability karst.

Alternative 3 (Preferred DEIS)

Framework

The framework for Alternative 3 emphasizes the protection of high vulnerability karst resources and Draft Interim-designated HCA's. Under this alternative, no harvest is proposed on high vulnerability karst areas, as mapped in the 1994 Karst Vulnerability Assessment Report. In addition, no harvest would occur within the Draft Interim-designated HCA's.

Resource Outputs

Implementation of Alternative 3 would result in the harvest of approximately 66 MMBF of timber from 83 harvest units. This volume would be harvested from approximately 3,050 acres and includes 12 MMBF of timber from the clearing for approximately 55 miles of new roads. One new Log Transfer Facility would be constructed for the proposed harvest of Thorne Island. Payments to the State of Alaska are estimated at $3.1 million and approximately 102 direct jobs would be supported during year three of the harvest..

Environmental Consequences

A summary of the environmental effects of implementing Alternative 3 is presented below.

- *Issue 1: Timber*
  Approximately 66 MMBF of timber would be made available for harvest under this alternative. The resulting change in high volume class timber proportion would be +0.34, -0.31, and -0.13 percent above or below the TTRA Base (November 28, 1990) proportion for Management Areas K01, K02, and K03. The proposed harvest would increase the high volume proportion in each Management Area in comparison with the No Action Alternative.

- *Issue 2: Subsistence*
  Alternative 3 may result in a significant restriction of subsistence use of Sitka black-tailed deer by the residents of Coffman Cove, Craig, Klawock, Wrangell, Point Baker, Port Protection,

and Whale Pass. Effects would be pronounced for residents of the latter three communities. Overall effects would rank as less than those for Alternatives 2, 4, and 5 and significantly more than Alternative 6. Subsistence use of black bear may be restricted in WAA 1527 if the pattern of harvest by nonrural hunters continues as access increases. This effect would increase if the Calder Tie Road were constructed. Additionally, the effects of current conditions described in Alternative 1 are applicable.

- *Issue 3: Wildlife and Biodiversity*
  Under this alternative, 2,782 acres of old-growth habitat would be harvested, representing approximately 4 percent of the total remaining old growth in the Project Area. In addition, 259 acres of riparian habitat would be harvested. Road construction would result in the harvest of an additional 161 acres of old-growth habitat, 63 acres of riparian habitat, and 4 acres that are within Beach Fringe and Estuary. Fifty-nine miles of road construction/reconstruction is proposed under this alternative, 55 miles of which are recommended for closure after completion of harvest. The new Log Transfer Facility on Thorne Island would result in additional habitat disturbance for those species using the waters near the site and those that use beach fringe habitat.

  The number of 500-1,000 acre old-growth patches would be reduced from six to five under Alternative 3, and 100-500 acre old-growth patches would be reduced from 25 to 24. No harvest would occur within the Draft Interim-designated HCA's, located near Buster Creek and within the Salmon Bay LUD II, or within the High Vulnerability Karst areas. Harvest would occur within the Project-defined COGA's.

  This direct loss of habitat and the increase in fragmentation would result in no change (black bear, river otter, bald eagle populations) to a 4 percent (hairy woodpecker) decrease in wildlife habitat capability over current conditions within the Project Area. Black-tailed deer habitat capability would be reduced by 1.5 percent over current conditions. Threatened or endangered species would not be affected.

- *Issue 4: Fish Habitat and Water Quality*
  Timber harvest and road construction would occur within the watershed supplying the Whales Resort area. There would be approximately 1,216 acres harvested and 17 miles of road constructed on slopes with high potential for direct or indirect delivery of sediment to a Class I stream. One watershed currently exceeding the HGC cumulative harvest threshold would receive additional harvest. Harvest within two other watersheds would exceed the HGC threshold. Retention of wind-firm trees within the HGC zone is proposed to mitigate these effects. Road construction and reconstruction would require 12 stream crossings that are recommended to receive timing restrictions in order to minimize effects on fish resources.

- *Issue 5: Recreation*
  Alternative 3 would shift 32,197 acres from Semi-Primitive Nonmotorized, Primitive, Semi-Primitive Motorized, and Roaded Natural recreational uses to Roaded Modified uses.

- *Issue 6: Visuals*
  Twenty-five harvest units would be visible from Priority Travel Routes and Use Areas. Five of these units would be seen from more than one Priority Travel Route and Use Area. No visible harvest would occur in landscapes with an adopted VQO of Retention. Harvest would be visible in areas of Partial Retention, Modification, and Maximum Modification VQO's. The Log Transfer Facility proposed on Thorne Island would not meet the adopted Partial Retention VQO for the duration of its use.

- *Issue 7: Social and Economic Factors*
  Although a consistent supply of timber and associated jobs would continue in the near term under this alternative, long-term timber supplies could be less, resulting in a smaller future work force. The Project Area TSPIRS analysis estimates a net gain from timber harvest of $4.1 million, while the Present Net Value estimates a gain of $2.5 million under this alternative.

- *Issue 8: Karst*
  Alternative 3 includes approximately 23 acres of harvest on karstlands, none of which are rated as high vulnerability. Less than one-half of mile of road would be constructed on high vulnerability karst.

Alternative 4

Framework

The framework for Alternative 4 is based on harvesting timber while protecting blocks of wildlife habitat and travel corridors. No harvest is proposed within the Lab Bay Project-defined contiguous old-growth areas (COGA's). These COGA's were designed based on Project-specific habitat information. Timber harvest would be allowed within proposed wildlife corridors and managed on a 195-year rotation. Within Project-defined COGA's, 2.4 miles of new road would be constructed. An additional 4.5 miles would be constructed within Project-defined corridors. All new roads within COGA's and corridors are proposed for closure after completion of harvest. Under this alternative, timber harvest on Thorne Island will be conducted according to an uneven-aged management plan using helicopter yarding methods (as described in Appendix E). No Log Transfer Facility or roads would be constructed on Thorne Island under this alternative.

Resource Outputs

Implementation of Alternative 4 would result in the harvest of approximately 62 MMBF of timber from 78 conventional harvest units and one uneven-aged management unit. This volume would be harvested from approximately 3,100 acres and includes 11 MMBF of timber from the clearing of approximately 47 miles of new roads. Payments to the State of Alaska are estimated at $2.4 million and approximately 95 direct jobs would be supported during year three of the harvest.

Environmental Consequences

A summary of the environmental effects of implementing Alternative 4 is presented below.

- *Issue 1: Timber*
  Approximately 62 MMBF of timber would be made available for harvest under this alternative. The resulting change in high volume class timber proportion would be +0.30, -0.14, and -0.16 percent above or below the TTRA Base (November 28, 1990) proportion for Management Areas K01, K02, and K03. The proposed harvest would increase the high volume proportion in each Management Area in comparison with the No Action Alternative.

- *Issue 2: Subsistence*
  Alternative 4 may result in a significant restriction of subsistence use of Sitka black-tailed deer by the residents of Coffman Cove, Craig, Klawock, Wrangell, Point Baker, Port Protection, and Whale Pass. Effects would be pronounced for residents of the latter three communities. Overall effects would rank as somewhat less than those for Alternative 2, about the same as for Alternative 5, greater than for Alternative 3, and significantly more than Alternative 6. Subsistence use of black bear may be restricted in WAA 1527 if the pattern of harvest by nonrural hunters continues as access increases. This effect would increase if the Calder Tie Road were constructed. Additionally, the effects of current conditions described in Alternative 1 are applicable.

- *Issue 3: Wildlife and Biodiversity*
  Under this alternative, 2,658 acres of old-growth habitat would be harvested, representing approximately 3 percent of the total remaining old growth in the Project Area. In addition, 264 acres of riparian habitat, and 36 acres within the beach fringe (Thorne Island) would be harvested. Road construction would harvest an additional 144 acres of old-growth habitat, 52 acres of riparian habitat, and 4 acres that are within Beach Fringe and Estuary. Fifty miles of road construction/reconstruction is proposed under this alternative, 47 miles of which are recommended for closure after completion of harvest. Harvest on Thorne Island would occur in two-acre (average) patch cuts to mimic natural disturbances; neither roads nor a Log Transfer Facility would be constructed on Thorne Island.

The number of old-growth patches 500-1,000 acres in size would be reduced from six to four under Alternative 4. The Project-defined COGA's would not be entered for harvest and the Project-defined Corridors would be harvested under a 195-year rotation. This would maintain large blocks of old-growth habitat and the corridors would ensure connectivity between COGA's as well as providing connection to the area south of the Project Area. Harvest would occur within portions of the Draft Interim-designated HCA's.

This direct loss of habitat and the increase in fragmentation would result in no change (black bear, river otter, and bald eagle) to a 3 percent (hairy woodpecker) decrease in wildlife habitat capability over current conditions within the Project Area. Black-tailed deer habitat capability would be reduced by 1.2 percent over current conditions. Under this alternative, no harvest would occur within the Project-defined COGA's and corridors. Threatened or endangered species would not be affected.

- *Issue 4: Fish Habitat and Water Quality*
  There would be approximately 988 acres harvested and 17 miles of road constructed on slopes with high potential for direct or indirect delivery of sediment to a Class I stream. Timber harvest and road construction would occur within the watershed supplying the Whales Resort area. Harvest within one watershed would exceed the HGC cumulative harvest threshold. Retention of wind-firm trees within the HGC zone is proposed to mitigate these effects. Road construction and reconstruction would require 17 stream crossings that are recommended to receive timing restrictions in order to minimize effects on fish resources.

- *Issue 5: Recreation*
  Alternative 4 would shift 32,267 acres from Primitive, Semi-Primitive Motorized, Semi-Primitive Nonmotorized, and Roaded Natural uses to Roaded Modified uses.

- *Issue 6: Visuals*
  Twenty-one harvest units would be visible from Priority Travel Routes and Use Areas. Five of these units would be seen from more than one Priority Travel Route and Use Area. The uneven-aged treatment proposed for Thorne Island and its associated helicopter yarding will substantially reduce visual impact in this segment of the Whale Pass viewshed, when compared to conventional logging methods. No visible harvest would occur in landscapes with an adopted Retention VQO. Harvest would be visible in areas of Partial Retention, Modification, and Maximum Modification.

- *Issue 7: Social and Economic Factors*
  Although a consistent supply of timber and associated jobs would continue in the near term under this alternative, long-term timber supplies could be less, resulting in a smaller future work force. The Project Area TSPIRS analysis estimates a net gain from timber harvest of $3.2 million, while the Present Net Value estimates a gain of $2.5 million under this alternative.

- *Issue 8: Karst*
  Alternative 4 includes approximately 711 acres of harvest on karstlands, of which 491 acres are rated as high vulnerability. About 7 miles of road would be constructed on high vulnerability karst.

Alternative 5

Framework

This alternative is designed to harvest groups of units that fall within common geographical areas. Units were selected with consideration for cost-effectiveness of road construction as well as haul distance.

Resource Outputs

Implementation of Alternative 5 would result in the harvest of approximately 69 MMBF of timber from 85 units. This volume would be harvested from approximately 3,100 acres and includes 13 MMBF of timber from the clearing for approximately 60 miles of new roads. One new Log Trans-

fer Facility would be constructed for the harvest proposed on Thorne Island. Payments to the State of Alaska are estimated at $3.1 million and approximately 107 direct jobs would be supported during year three of the harvest.

Environmental Consequences

A summary of the environmental effects of implementing Alternative 5 is presented below.

- *Issue 1: Timber Supply*
  Approximately 69 MMBF of timber would be made available for harvest under this alternative. The resulting change in high volume class timber proportion would be -0.27, -0.14, and -0.16 percent above or below the TTRA Base (November 28, 1990) proportion for Management Areas K01, K02, and K03. The proposed harvest would increase the high volume class proportion in Management Areas K02 and K03 in comparison with the No Action Alternative. The high volume class proportion in Management K01 would be lower than that of the No Action Alternative.

- *Issue 2: Subsistence*
  Alternative 5 may result in a significant restriction of subsistence use of Sitka black-tailed deer by the residents of Coffman Cove, Craig, Klawock, Wrangell, Point Baker, Port Protection, and Whale Pass. Effects would be pronounced for residents of the latter three communities. Overall effects would rank as somewhat less than those for Alternative 2, about the same as for Alternative 4, greater than Alternative 3, and significantly more than Alternative 6. Subsistence use of black bear may be restricted in WAA 1527 if the pattern of harvest by nonrural hunters continues as access increases. This effect would increase if the Calder Tie Road were constructed. Additionally, the effects of current conditions described in Alternative 1 are applicable.

- *Issue 3: Wildlife and Biodiversity*
  Under this alternative, 2,837 acres of old-growth habitat would be harvested, representing approximately 4 percent of the old growth remaining in the Project Area. In addition, 258 acres of riparian habitat would be harvested. Road construction would harvest an additional 173 acres of old-growth habitat, 63 acres of riparian habitat, and 6 acres that are within Beach Fringe and Estuary. Sixty miles of road construction/reconstruction is proposed under this alternative, 56 miles of which are recommended for closure after completion of harvest. The new Log Transfer Facility on Thorne Island would result in additional habitat disturbance for those species using the waters and beach fringe near the site.

  The number of old-growth patches 500-1,000 acres in size would be reduced from six to four under Alternative 5. This direct loss of habitat and the increase in fragmentation would result in no change (black bear, river otter, and bald eagle) to a 4 percent (hairy woodpecker) decrease in wildlife habitat capability over current conditions within the Project Area. Black-tailed deer habitat capability would be reduced by 1.3 percent over current conditions. Threatened or endangered species would not be affected.

  Harvest would occur within Draft Interim-designated HCA's and Project-defined COGA's.

- *Issue 4: Fish Habitat and Water Quality*
  There would be approximately 1,285 acres harvested and 18 miles of road constructed on slopes with high potential for direct or indirect delivery of sediment to a Class I stream. Road construction would occur adjacent to the 2 watersheds supplying Port Protection. One watershed currently exceeding the HGC cumulative harvest threshold would receive additional harvest. Harvest within three other watersheds would exceed the HGC threshold. Retention of wind-firm trees within the HGC zone is proposed to mitigate these effects. Road construction and reconstruction would require 20 stream crossings that are recommended to receive timing restrictions.

- *Issue 5: Recreation*
  Alternative 5 would shift 29,974 acres from Primitive, Semi-Primitive Nonmotorized, Semi-Primitive Motorized, and Roaded Natural uses to Roaded Modified uses.

- *Issue 6: Visuals*
  Alternative 5 includes 35 harvest units that would be visible from Priority Travel Routes and Use Areas. Thirteen of these units would be seen from more than one Priority Travel Route and Use Area. No visible harvest would occur in landscapes with an adopted VQO of Retention. Harvest would be visible in areas of Partial Retention, Modification, and Maximum Modification VQOs. The Log Transfer Facility proposed on Thorne Island would not meet the adopted partial Retention VQO for the duration of its use.

- *Issue 7: Social and Economic Factors*
  Although a consistent supply of timber and associated jobs would continue in the near term under this alternative, long-term timber supplies could be less, resulting in a smaller future work force. The Project Area TSPIRS analysis estimates a net gain from timber harvest of $4.1 million, while the Present Net Value estimates a gain of $2.6 million under this alternative.

- *Issue 8: Karst*
  Alternative 5 includes approximately 791 acres of harvest on karstlands, of which 584 acres are rated as high vulnerability. About 6 miles of road would be constructed on high vulnerability karst.

Alternative 6 (Preferred FEIS)

Framework

Alternative 6 emphasizes the protection of high vulnerability karst resources and high value subsistence, wildlife, and visual resources. Under this alternative, no harvest is proposed on high vulnerability karst areas.

Many areas with high subsistence use and high wildlife value were deferred from Alternative 6. Entry into large, Project-defined COGA's was minimized by placing harvest units at the outside edge of blocks. In addition, no harvest units are located within the HCA's proposed under the Draft Interim Management Guidelines (USDA Forest Service 1994b). Units with a high level of visual impact near important recreation and residential areas were excluded from this alternative. Timber harvest on Thorne Island will be conducted according to an uneven-aged management plan using helicopter yarding methods (as described in Appendix E). No Log Transfer Facility or roads would be constructed on Thorne Island. Construction of the Calder Tie Road would not occur under this alternative.

Resource Outputs

Implementation of Alternative 6 would result in the harvest of approximately 40 MMBF of timber from 46 conventional harvest units and one uneven-aged management unit. This volume would be harvested from approximately 1,900 acres and includes 6 MMBF of timber from the clearing of approximately 29 miles of new road. Payments to the State of Alaska are estimated at $1.8 million and approximately 62 direct jobs would be supported during year three of an estimated 4-year harvest period.

Environmental Consequences

A summary of the environmental effects of implementing Alternative 6 is presented below.

- *Issue 1: Timber*
  Approximately 40 MMBF of timber would be made available for harvest under this alternative. The resulting change in high volume class timber proportion would be +0.48, -0.41, and -0.39 percent above or below the TTRA Base (November 28, 1990) proportion for Management Areas K01, K02, and K03. The proposed harvest would increase the high volume class proportion in each Management Area in comparison with the No Action Alternative.

- *Issue 2: Subsistence*
  Alternative 6 may result in a significant restriction of subsistence use of Sitka black-tailed deer by residents of Coffman Cove, Craig, Klawock, Wrangell, Point Baker, Port Protection, and Whale Pass. Effects would be more pronounced for residents of the latter three communities.

Overall effects would be significantly less than for any other action alternative and, with the exception of Point Baker, Port Protection, and Whale Pass, are primarily related to cumulative (past, multi-project) rather than to direct (project-specific) effects. Subsistence use of black bear may be restricted in WAA 1527 if the pattern of harvest by nonrural hunters continues as access increases. Additionally, the effects of current conditions described in Alternative 1 are applicable.

- *Issue 3: Wildlife and Biodiversity*
  Under this alternative, 1,843 acres of old-growth habitat would be harvested, representing approximately 2 percent of the total remaining old growth in the Project Area. In addition, 141 acres of riparian habitat and 36 acres within the beach fringe (Thorne Island) would be harvested. Road construction would result in the harvest of an additional 156 acres of old-growth habitat, 26 acres of riparian habitat, and 0.4 acres that are within Beach Fringe and Estuary. Twenty-nine miles of road construction and 4 miles of reconstruction are proposed under this alternative, 29 miles of which are recommended for closure after completion of harvest. Harvest on Thorne Island would occur in two-acre (average) patch cuts to mimic natural disturbances; neither roads nor a Log Transfer Facility would be constructed on Thorne Island.

  The number of 500 to 1,000-acre old-growth patches would be reduced from six to five under Alternative 6. No harvest would occur within the Draft Interim-designated HCA's, located near Buster Creek and within the Salmon Bay LUD II, or within the High Vulnerability Karst areas. Entry into the Project-defined COGA's and corridors would be minimized and would occur near the edges of these areas. In addition, harvest of low elevation, deer winter range was minimized under Alternative 6.

  This direct loss of habitat and the increase in fragmentation would result in no change (black bear, river otter, bald eagle populations) to a 2.5 percent (hairy woodpecker) decrease in wildlife habitat capability over current conditions within the Project Area. Black-tailed deer habitat capability would be reduced by 1.1 percent over current conditions. Threatened or endangered species would not be affected.

- *Issue 4: Fish Habitat and Water Quality*
  There would be approximately 788 acres harvested and 8 miles of road constructed on slopes with high potential for direct or indirect delivery of sediment to a Class I stream. Timber harvest and road construction would not occur within any domestic supply watersheds. The proposed harvest would not exceed the HGC cumulative harvest threshold for any watershed. Road construction and reconstruction would require 9 stream crossings that are recommended to receive timing restrictions.

- *Issue 5: Recreation*
  Alternative 6 would shift 19,732 acres from Primitive, Semi-Primitive Nonmotorized, Semi-Primitive Motorized, and Roaded Natural recreational uses to Roaded Modified uses.

- *Issue 6: Visuals*
  Seven harvest units would be visible from Priority Travel Routes and Use Areas. Three of these units would be seen from more than one Priority Travel Route and Use Area. No visible harvest would occur in landscapes with an adopted VQO of Retention. Harvest would be visible in areas of Partial Retention, Modification, and Maximum Modification VQO's. The Uneven-aged Management Plan proposed for Thorne Island and its associated helicopter yarding will substantially reduce visual impacts in this segment of the Whale Pass viewshed, when compared to conventional logging methods.

- *Issue 7: Social and Economic Factors*
  Although a consistent supply of timber and associated jobs would continue in the near term under this alternative, long-term timber supplies could be less, resulting in a smaller future work force. The Project Area TSPIRS analysis reflects a net gain from timber harvest of $2.3 million, while the Present Net Value shows a gain of $1.7 million under this alternative.

- *Issue 8: Karst*
  Alternative 6 includes approximately 138 acres of harvest on karstlands, none of which are

rated as high vulnerability. Approximately 0.1 mile of road would be constructed on high vulnerability karst. Mitigation is prescribed for the proposed road segments.

Preferred Alternative

Using an evaluative process that compares the benefits and adverse effects of each alternative against the issues, the USDA Forest Service has identified Alternative 6 as the preferred alternative for the Final EIS. Alternative 3 was the preferred alternative for the Draft EIS. A final determination will be made by the Ketchikan Area Forest Supervisor in the Record of Decision (ROD).

Comparison and Evaluation of Alternatives

This section describes the environmental consequences of each alternative in a comparative format. Table 2-2 summarizes the environmental consequences of the alternatives. All numbers presented are either absolute or relative to Alternative 1, No Action. Finally, the alternatives are compared and evaluated relative to the significant issues identified in Chapter 1. For more detailed descriptions of the affected environment and the environmental consequences of the alternatives, refer to Chapter 3.

- *Issue 1: Timber Supply*
  All action alternatives would provide a supply of timber to help meet the KPC contract requirements. Alternative 2 would provide approximately 101 MMBF, while Alternatives 3, 4, 5, and 6 would provide 66, 62, 69, and 40 MMBF of timber, respectively.

  Selection of the No Action alternative would result in all three Management Areas remaining below the TTRA Base (November 28, 1990) proportion for high volume timber. Alternative 4 would result in the greatest improvement in the proportion of high volume remaining in the Project Area after harvest. Alternative 6 harvests the least amount of high volume timber (130 acres) of any alternative.

  Alternatives 2, 3, and 5 would harvest 619 acres on Thorne Island using conventional methods supported by 15.5 miles of new road and one Log Transfer Facility. Alternatives 4 and 6 would have the least impact on Thorne Island by implementing an uneven-aged management plan. These alternatives would harvest approximately 218 acres on Thorne Island, using 2-acre (average) patch cuts harvested by helicopter yarding.

- *Issue 2: Subsistence*
  All alternatives including the No Action alternative may result in a significant possibility of a significant restriction on the subsistence use of black bear, deer, and river otter, based on cumulative effects of past actions. The proposed action alternatives may also directly affect subsistence use to varying degrees. These effects would be felt by the communities of Coffman Cove, Craig, Klawock, Naukati, Point Baker, Port Protection, Whale Pass, and Wrangell. For reasons described in this EIS, Point Baker, Port Protection, and Whale Pass are the communities potentially most affected and the alternatives are compared primarily in terms of effects upon these communities.

  Of the action alternatives, Alternative 6 presents the least possibility of a significant restriction on subsistence uses, while Alternative 2 presents the greatest. Action alternatives 3, 4, and 5 are approximately equivalent and would have greater effects than would Alternative 6. The No Action Alternative has the fewest potential effects.

  Two "severable" elements are assessed separately, the Calder Tie Road and the Thorne Island uneven-aged management plan. The Calder Tie Road would increase access within WAA 1527, potentially affecting the harvest of deer and black bear in that area. This would pose a potential restriction to Point Baker and Port Protection hunters in terms of both abundance and distribution of, as well as competition for these animals. Subsistence hunters from other communities may benefit from increased access to this area, but the potential restriction may be of

greater significance. Alternative 6 specifically excludes to proposes Calder Tie Road, decreasing its potential effect on subsistence. Thorne Island is proposed for harvest in all alternatives, either with a conventional roaded harvest method or an uneven-aged management plan with no roads and helicopter logging. The conventional harvest method has greater potential to restrict subsistence use than the uneven-aged management plan. Under the uneven-aged plan, the potential effects may be confined to the time when timber harvest is actually conducted, thus affecting access for a relatively short time and probably not affecting abundance and distribution to any great degree. The conventional harvest plan would affect both abundance and distribution, as well as access, for a much longer period of time. Thus, Alternatives 4 and 6, which include the Thorne Island uneven-aged management plan, have fewer potential restrictive effects upon subsistence resource use.

- *Issue 3: Wildlife and Biodiversity*
The major effects on wildlife habitats in all action alternatives are the reduction of old-growth forest habitat (Volume Classes 4 through 7) and increased access by the construction or reconstruction of roads into presently unroaded areas.

Alternative 2 would have the greatest effect on old-growth habitat and effects due to new roading, while Alternative 6 would have the least effect among the action alternatives. All alternatives would result in effects consistent with the implementation of TLMP (1979, as amended), Alternative P of the TLMP Draft Revision (1991a), and in general with the recently published 1996 TLMP Draft Revision, which is based on Alternative P of the 1991 TLMP Draft Revision. Alternatives 4 and 6 incorporate an uneven-aged management plan for Thorne Island which proposes harvest of 36 acres of beach fringe habitat. This is consistent with both the 1991 and 1996 TLMP Draft Revisions' beach fringe LUD, which was proposed as mitigation for even-aged harvest systems.

All action alternatives would reduce the frequency and size of large, unfragmented old-growth patches (Table 2-3). High-value, relatively unfragmented blocks of old-growth habitat were identified in the vicinity of Mt. Calder/Mt. Holbrook LUD II, Baker Creek, Calder Bay, Perue Peak, Red Lake, Red Bay, and Salmon Bay Lake. Alternatives 2 and 5 enter all of these areas (with the exception of the LUD II), Alternative 3 enters all but the Calder Bay block, Alternative 6 enters all but the Calder Bay and Baker Creek blocks, and Alternative 4 avoids all of the identified blocks.

Four different conservation biology strategies are incorporated into the action alternatives, representing varying levels of risk over the long term. By year 2054, implementation of either the draft karst or Project-defined COGA strategy will have maintained the largest areas of contiguous old-growth habitat and travel corridors distributed throughout the Lab Bay Project Area. In addition, the Project-defined COGA strategy would provide a future wildlife travel link between the Lab Bay and CPOW Project Areas. Implementation of TLMP (1979), the proposed LUD system (TLMP Draft Revision 1991a), or the Draft Interim HCA Guidelines (USDA Forest Service 1994b) would result in a smaller number of large old-growth areas distributed across the Project Area by the year 2054, and would not maintain east-west travel corridors or the future habitat connection between the Lab Bay and CPOW Project Areas.

Alternatives 4 and 6 would cause the least impact to Thorne Island by implementing an uneven-aged management plan that would harvest approximately 218 acres, using two-acre (average) patch cuts and access by helicopter. No roads would be built on Thorne Island under this alternative. Alternatives 2, 3, and 5 would harvest 619 acres on Thorne Island using conventional methods and build 15.5 miles of road. Under Alternatives 2, 3, and 5, a new Log Transfer Facility would be built on Thorne Island, resulting in additional habitat and disturbance effects for those species using the waters and beach fringe near the site.

MIS habitat capability would be reduced under the action alternatives by 0 to 6 percent depending on the species and alternative (Table 2-3). Threatened or endangered species would not be affected.

- *Issue 4: Fish Habitat and Water Quality*
The primary effect of the action alternatives on fish habitat and water quality would be increased erosion and sedimentation due to timber harvest and road construction. However, best management practices designed to minimize delivery of sediment to stream channels will be implemented under all action alternatives. All alternatives would be consistent with the standards and guidelines for watershed analysis and for protection of fisheries and water quality resources in the TLMP Draft Revision (1991a) and the 1996 TLMP Draft Revision.

Alternative 2 involves construction of 26 miles of road and harvest of 1,781 acres on slopes with high potential for direct or indirect delivery of sediment to a Class I stream. These harvest units and roads, however, do not necessarily have a high potential for mass wasting to occur. Rather, there is high potential for sediment to be delivered, directly or indirectly, to a stream channel assuming that erosion does occur. Alternatives 3, 4, and 5 involve 17-18 miles of road construction and 1,000 (Alternative 4) to 1,300 (Alternative 3) acres of timber harvest on such slopes. Alternative 6 involves considerably fewer acres of timber harvest (788) and miles of roads (8) with high potential for delivering sediment to a Class I stream. Under Alternatives 2, 3, 4, and 5, most of the roads and harvest units with the greatest risk are located in the Alder, 108, Buster, and Calder Creek watersheds. Alternative 6, however, does not propose any harvest in the 108 or Calder Creek watersheds.

All action alternatives would increase the number of stream crossings through construction of new roads. Alternative 2 would require the largest number of crossings of Class I and II streams (34). Alternative 5 would require 26, Alternative 3 would require 20, and Alternative 4 would require 16. Alternative 6 would require 10 crossings of Class I and II streams.

Increased access to watersheds supplying domestic water users increases the potential for bacterial contamination of water supplies. Under Alternatives 2 and 5 there would be a temporary increase in access to the Spring and Cove Creek watersheds serving Port Protection. Geotechnical investigations would be required prior to road construction due to the karst topography and intricate subsurface drainage patterns. Alternatives 2, 3, and 4 involve 0.3 miles of new road access and 11 acres of timber harvest in a small watershed serving Whales Resort and 3 families. All of these roads would be closed immediately following timber removal. Alternative 6 does not include any timber harvest or new road access to any domestic supply watersheds.

None of the alternatives include harvest units in a watershed where more than 35 percent of the area has been harvested in the 15 years prior to 1994.

Alternatives 2, 3, 4, and 5 have the potential to cause exceedance of HGC zone cumulative harvest guidelines. Alternatives 2 and 5 could exceed the threshold in 4 watersheds, Alternative 3 could exceed the threshold in 3 watersheds, and Alternative 4 could exceed the threshold in one watershed. Retention of wind-firm trees is proposed as mitigation in these alternatives to avoid exceedance of HGC cumulative harvest guidelines. Harvest of units under Alternative 6 would not cause any watersheds to exceed the HGC threshold, and therefore, no mitigation is proposed for this alternative.

- *Issue 5: Recreation*
The proposed action alternatives would not change recreation settings or activities for the majority of the 48 inventoried Recreation Places. The most change would occur in the interior areas around Calder Mountain, Red Lake, and on Thorne Island. All action alternatives would affect the central portion of the Project Area, and change the "Perue" Peak/Lake Recreation Place to a Roaded Modified setting. Units proposed in all alternatives would cause Semi-Primitive Nonmotorized ROS settings west and southeast of Red Lake to become Roaded Modified. Thorne Island would shift from Semi-Primitive Nonmotorized and Semi-Primitive Motorized to the Roaded Modified ROS setting as a result of harvest activity under Alternatives 2, 3, and 5. Alternatives 4 and 6 would helicopter log Thorne Island in small, scattered two-acre (average) parcels. Although two areas of Semi-Primitive Motorized ROS would remain, much of the island would, by ROS definition, become Roaded Modified.

The existing Calder, El Capitan, Salmon Bay, and Thorne Island roadless areas would be affected by the Project. A number of units would be spread throughout the El Capitan roadless area in each action alternative, changing much of its Semi-Primitive Nonmotorized Setting to Roaded Modified. Units within the Salmon Bay roadless area are concentrated north of the Salmon Bay LUD II area and would cause a noticeable reduction in the Primitive ROS setting. Most of the proposed roadless areas within the Project Area would be altered by harvesting and road construction. Alternatives 2 and 3 would create the most change. Alternative 4 proposes no harvest in the Calder roadless area. Overall, Alternative 6 would harvest less timber in roadless areas than the other action alternatives.

- *Issue 6: Visuals*
  Action alternatives would harvest varying amounts of timber visible from Priority Travel Routes and Use Areas. Alternatives 2 would harvest 42 units visible from all eight identified Priority Travel Routes and Use Areas. Thirteen of these units would be apparent in more than one viewshed. Alternative 3 would harvest 25 units visible from five Priority Travel Routes and Use Areas. Five units proposed by Alternative 3 would be apparent from more than one such area. Alternative 4 would harvest 21 units within six Priority Travel Route and Use Area viewsheds. Five Alternative 4 units would be apparent in more than one viewshed. Alternative 5 would harvest 35 units in all eight viewsheds, with 13 units visible in more than one viewshed. Lastly, Alternative 6 would harvest seven units in three Priority Travel Route and Use Area viewsheds. Three Alternative 6 units are visible within more than one viewshed. No Alternative 6 units would be visible from Port Protection, Red Lake, Exchange Cove, or the West Coast Waterway. Alternative 6 would also harvest approximately 109 two-acre patches on Thorne Island using helicopters and barges. This treatment, which is also included in Alternative 4, would result in less visual impact in this portion of the Whale Pass viewshed than would activities proposed by the other action alternatives.

- *Issue 7: Social and Economic Factors*
  The No Action alternative would provide no new resource outputs or economic/employment opportunities. The action alternatives would provide employment ranging from an estimated 62 jobs (Alternative 6) to 156 jobs (Alternative 2) during year three of the four-year harvest period.

  Of the action alternatives, Alternative 2 would provide the greatest number of jobs (156), employee compensation ($9.4 million), and payments to the state ($4.8 million) and the highest present net value ($4.1 million). Alternatives 3, 4, and 5 provide roughly equal economic benefits. These three alternatives would provide approximately 100 jobs during year three, $6 million in employee compensation, and $2.7 million in payments to the state. Alternative 6 provides the lowest number of jobs during year three (62), lowest employee compensation ($3.7 million), and lowest payments to state ($1.8 million).

- *Issue 8: Karst*
  Alternative 2 would result in the most units, greatest area (1,314 acres), and most miles of road (11) on karstland areas. Of the proposed harvest on karstlands in this alternative, 1,068 acres (84 percent) would occur on high vulnerability karst areas. Thirty-one (31) harvest units contain significant karst features (caves, vertical shafts, insurgences or resurgences, or other features with direct atmospheric or hydrologic connections between the surface and subsurface). Two harvest units are located within known domestic watersheds. Under Alternative 2, harvesting within 28 units could cause irreversible resource damage.

  Alternatives 4 and 5, which have distributions of units and areas that are similar with respect to each other, would each result in fewer units, area and miles of road on karstlands than would Alternative 2. Alternative 4 has 16 harvest units that contain significant karst features. Harvesting within 14 units could cause irreversible resource damage. Alternative 5 has 20 units that contain significant karst features, and 2 units that are located within known domestic watersheds. Under this alternative, harvesting within 18 units could cause irreversible resource damage.

Alternative 3, which was formulated to avoid harvest on high vulnerability karst areas, would harvest 23 acres on low or moderate vulnerability karst areas and is not expected to cause irreversible resource damage.

Alternative 6 emphasizes the protection of high vulnerability karst resources. Harvest would occur on 138 acres of karstlands, none of which are rated as high vulnerability. The proposed harvest is not likely to cause irreversible karst resource damage because karst features, which are broadly dispersed over gentle slopes with deep soils, can be effectively protected. Alternative 6 is consistent with the standards and guidelines for protection of karst resources proposed in the 1996 TLMP Draft Revision.

Table 2-2

Comparison of Environmental Consequences by Alternative

Environmental Consequence		Unit	Alternative 1	2	3	4	5	6
Harvest Units								
Number of Units		No.	0	125	83	78[1]	85	47
Average Size		Acres	0	36	37	35[2]	37	36[2]
Openings over 100 Acres		No.	0	0	0	0	0	0
Total Acres		Acres	0	4,550	3,040	2,919	3,106	1,885
Volume								
Total Volume		MBF	0	101,322	65,756	61,745	69,335	40,065
Silviculture/Vegetation								
Proportionality	TTRA Base (November 28, 1990)							
K01	37.26	Percent	37.05	37.12	37.60	37.56	36.99	37.74
K02	23.29	Percent	22.31	23.14	22.97	23.14	23.14	22.87
K03	18.22	Percent	17.50	18.40	18.09	18.06	18.06	17.83
Volume Class Harvested								
VC4		Acres	0	1,494	1,211	1,136	965	730
VC5		Acres	0	1,928	1,217	1,198	1,315	847
VC6		Acres	0	552	225	227	469	118
VC7		Acres	0	220	129	97	89	12
Silvicultural System (Harvest Type)[3]								
Clearcut								
Type A		Acres	0	417	359	274	302	160
Type B		Acres	0	1,225	953	787	736	607
Type C		Acres	0	179	119	360[4]	93	282[4]
Type D		Acres	0	1,680	1,048	911	1,279	503
Overstory Removal		Acres	0	202	111	148	202	177
Seed Tree		Acres	0	205	188	205	154	94
Shelterwood (light)		Acres	0	169	169	80	98	9
Shelterwood (heavy)		Acres	0	23	0	2	23	0
Single Tree/Group Selection		Acres	0	449	92	151	221	53
Karst								
Total Karstlands in Each Alternative		Acres	0	1,314	23	711	791	138
Harvest Units with High Vulnerability		No.	0	32	0	17	20	0
Proposed Harvest on High Karst Vulnerability		Acres	0	1,068	0	491	584	0

Table 2-2 (continued)
Comparison of Environmental Consequences by Alternative

Environmental Consequence	Unit	Alternative 1	2	3	4	5	6
Units in Karst Areas within Known Domestic Watershed	No.	0	2	0	1	2	0
Units with Significant Karst Features	No.	0	31	0	16	20	1
Roads on High Vulnerability Karst	Miles	0	10.7	0.4	6.8	5.5	0.1
Wetlands							
Percent of Wetland Acreage Affected	Percent	0	4	3	3	2	2
Wildlife Habitats							
Acres of Habitats Affected							
Old-growth Forest	Acres	0	4,427	2,943	2,802	3,010	1,999
Riparian	Acres	0	489	322	316	321	167
Beach Fringe and Estuary	Acres	0	7	4	40	6	36
Wildlife Habitat Capability (Relative to 1995)							
Percent Reduction of Habitat Capability							
Sitka Black-tailed Deer	Percent	0	2.1	1.5	1.2	1.3	1.1
Black Bear	Percent	0	0	0	0	0	0
Gray Wolf	Percent	0	2.0	1.3	1.3	1.3	1.3
Marten	Percent	0	4.1	2.9	2.5	2.9	1.2
River Otter	Percent	0	0	0	0	0	0
Bald Eagle	Percent	0	0	0	0	0	0
Vancouver Canada Goose	Percent	0	3.6	2.5	2.2	2.5	1.4
Red-breasted Sapsucker	Percent	0	5.7	4.0	3.5	3.8	2.2
Hairy Woodpecker	Percent	0	6.0	3.9	3.0	3.8	2.5
Brown Creeper	Percent	0	4.2	2.1	1.9	3.0	0.9
Biodiversity							
Unfragmented Interior Old-growth Patches Remaining							
1,000-10,000 Acres	No.	3	3	3	3	3	3
500-1,000 Acres	No.	6	4	5	4	4	5
100-500 Acres	No.	25	24	24	25	25	24
Conservation Strategies							
Draft Interim-designated HCA's							
Proposed Harvest Units	No.	0	5	0	5	2	0
Proposed Acres of Harvest	Acres	0	193	0	193	124	0
Project-defined COGA's							
Proposed Harvest Units	No.	0	26	13	0	22	6
Proposed Acres of Harvest	Acres	0	1,123	609	0	774	138
Project-defined Corridors							
Proposed Harvest Units	No.	0	12	7	3	8	5
Proposed Acres of Harvest	Acres	0	482	253	80	336	129
Watershed and Fish							
Harvest Unit Acres with High Potential for Sediment Delivery to a Class I Stream	Acres	0	1,781	1,216	988	1,285	788

Table 2-2 (continued)
Comparison of Environmental Consequences by Alternative

Environmental Consequence	Unit	1	2	3	4	5	6
				Alternative			
Road Miles with High Potential for Sediment Delivery to a Class I Stream	Miles	0	26	17	17	18	8
Number of Domestic Supply Watersheds Potentially Affected	No.	0	3	1	1	2	0
Number Watersheds Potentially Exceeding HGC Threshold Due to Proposed Harvest	No.	0	4	3	1	4	0
Number of Class I and II Stream Crossings	No.	0	34	20	16	26	10
Number of Stream Crossings w/Timing Restrictions	No.	0	28	12	17	20	9
Log Transfer Facilities							
Marine Habitat Affected by Bark Deposition	Acres	0	7.8	7.8	5.9	7.8	5.9
Recreation (Percent change)							
Primitive	Percent	0	-100	-100	-48	-100	-7
Rural	Percent	0	0	0	0	0	0
Roaded Modified	Percent	0	40	38	37	36	24
Roaded Natural	Percent	0	-10	-7	-1	-6	-5
Semi-Primitive Motorized	Percent	0	-34	-29	-20	-33	-27
Semi-Primitive Nonmotorized	Percent	0	-39	-38	-44	-33	-18
Visual Quality							
Impact to Priority Travel Route and Use Area Viewsheds	No. Units Visible	0	42	25	21	35	7
Cultural Resources							
Potential for Impacts to Known Cultural Resources	No. Units	0	1	1	0	1	0
Socio-economics							
Employment (Year 3)	No. Jobs	0	156	102	95	1087	62
Employee Compensation (Year 3)	Thousands $	0	$9,356	$6,081	$5,712	$6,411	$3,689
Payments to State	Thousands $	0	$1,548	$1,006	$945	$1,061	$610
Mid-Market Pond Log Value	$/MBF	0	$382	$383	$416	$390	$396
Current Value Pond Log Value	$/MBF	0	$521	$521	$521	$521	$521
Present Net Value	Millions $	0	$4.1	$2.5	$2.5	$2.6	$1.7
Subsistence							
Communities with a significant possibility of a significant restriction in subsistence use due to direct effects project action[5]							
Abundance/Distribution	No.	0	7	7	7	7	3
Access/Competition	No.	0	7	7	7	7	7
WAA's 1527, 1528, 1529, 1530							
Percent Reduction in Deer Habitat Capability Relative to Present Condition							
1527	Percent	0	-1	-1	-1	-1	-1
1528	Percent	0	-1	-1	-1	-1	-1

Table 2-2 (continued)
Comparison of Environmental Consequences by Alternative

Environmental Consequence	Unit	Alternative 1	2	3	4	5	6
1529	Percent	0	-2	-2	-2	-2	-2
1530	Percent	0	-2	-2	-2	-2	-2
Transportation System							
Number of New LTF's		0	1	1	0	1	0
Miles of New Road	Miles	0	77.9	54.7	47.3	57.1	28.7
Miles of New Road Proposed for Closure	Miles	0	74.5	52.2	44.4	53.8	26.1
Miles Existing Road Proposed for Closure	Miles	0	54.3	54.3	54.3	54.3	54.3
Acres of Road Clearing	Acres	0	708	497	430	519	261
Logging Systems							
High Lead	Acres	0	172	142	172	92	41
Live Skyline	Acres	0	592	497	417	476	299
Shovel	Acres	0	0	0	0	0	0
Running Skyline	Acres	0	2,405	1,661	1,248	1,806	917
Helicopter	Acres	0	811	405	728	467	483
Slackline	Acres	0	569	335	354	265	146
Calder Tie Road							
Miles of Construction	Miles	0	0.8	0.8	1.2	0.8	0
Construction Cost	Thousands $	0	$128	$128	$189	$128	0
Thorne Island							
Acres Harvested	Acres	0	619	619	218	619	218
Volume Harvested	MBF	0	8,154	8,154	3,563	8,154	3,563
Miles of Road	Miles	0	15.5	15.5	0	15.5	0
LTF Construction	No.	0	1	1	0	1	0
Cost per Thousand Board Feet	$/MBF	0	$455	$455	$380	$455	$380

1 This alternative includes the harvest of 109 2-acre patches on Thorne Island.

2 Average unit size, excluding the 109 2-acre patch cuts on Thorne Island.

3 Descriptions of the individual harvest types can be found in Appendix O.

4 Includes 218 acres of individual patch cuts on Thorne Island as part of the uneven-aged management plan.

5 All communities face a significant possibility of a significant restriction of subsistence use under all alternatives due to cumulative effects of past activities.

Effects of the Calder Tie Road

Development of a tie road connecting Road 29 near Labouchere Bay with Road 29 near Calder Bay was identified as an important issue during public scoping. Not only would it shorten the travel time between these points from approximately 2.5 hours to one hour, but it would enable heavy equipment to be transported by road to the Calder Bay area. Construction of this road is an option that may be incorporated into any of the action alternatives, except Alternative 6 which specifically excludes it. Its length would vary by alternative, depending upon access required to reach the array of selected units. Under Alternatives 2, 3 and 5, the road would be 0.8 miles long, and under Alternative 4, it would be 1.2 miles long. If constructed, approximately 1/8 mile of the road would cross an area mapped as high vulnerability karst. In compliance with the Federal Cave Resource Protection Act (1988), the road should be routed to avoid crossing, filling or routing drainage into karst features.

Construction of the tie road would remove approximately 145 thousand board feet of timber under Alternatives 2, 3, and 5, and 218 thousand board feet of timber under Alternative 4. The road would require the permanent removal of 7.3 acres (Alternatives 2, 3, and 5) to 10.9 acres (Alternative 4) of forested vegetation from the right-of-way. The road segment would not require any new crossings of Class I or II streams. The proposed right-of-way is in an area determined to have a low probability to contain cultural resources and is unseen from Visual Priority Travel Routes and Use Areas. Construction of the tie road would increase access to Recreation Places in the vicinity of Calder Bay but would not change the ROS class or directly affect any recreation places.

Another direct effect of tie road construction would be the reduction of old-growth habitat within the South Perue old-growth block. Open road densities and subsequent human access would increase, adversely affecting wildlife species sensitive to open roads, including deer, black bear, wolf and Vancouver Canada geese. Improved access could have significant effects on subsistence use in WAA 1527, and specifically to the Point Baker and Port Protection areas. Hunting pressure would increase, elevating harvest levels close to or beyond that supportable by local habitat capability.

Effects of Harvest on Thorne Island

Thorne Island presently is unroaded and only about 25 acres have been logged. Timber harvest on Thorne Island has been included as a component of each action alternative. Two different harvest approaches were analyzed: conventional harvest and an uneven-aged management plan. While a harvest method was assigned to each alternative, either approach could be applied to any of the alternatives.

The conventional harvest plan, incorporated into Alternatives 2, 3 and 5, would harvest 619 acres and would require the construction of 15.5 miles of road and one Log Transfer Facility. Silvicultural systems to be used are described in Chapter 3 and summarized in Table 2-4 below. The uneven-aged management plan, included in Alternatives 4 and 6, would use helicopters to log 218 acres in 2-acre (average) patch cuts distributed across the harvestable area of the island. Helicopter yarding to barges is proposed; thus, no new roads or LTF's would be constructed. Re-entry would be scheduled to occur every 15 years. A detailed description of the uneven-aged management plan, including economic analysis, is provided in Appendix E.

A comparison of the two harvest options for Thorne Island is shown in Table 2-3.

Table 2-3
Comparison of Thorne Island Management Plans

	Conventional Harvest	Uneven-aged Mgt. Plan
Acres Harvested	619	218
Volume Harvested (mbf)	8,154	3,563
Miles of Road	15.5	0
LTF Construction	1	0
Silvicultural System (Acres)		
Clearcut		
Type A	101	0
Type B	122	0
Type C	0	218
Type D	269	0
Overstory Removal	17	0
Seed Tree	0	0
Shelterwood (light)	89	0
Shelterwood (heavy)	0	0
Single Tree/Group Selection	21	0
Number of Units	18	109
Average Unit Size (acres)	34	2
Largest Unit (acres)	87	2
Smallest Unit (acres)	8	2
Cost per Thousand Board Feet	$455	$380

Implementation of the uneven-aged management plan on Thorne Island would reduce the potential for impacts to fisheries resources. By eliminating road construction, seven crossings of Class II streams and 26 crossings of Class III steams would not be required. Helicopter logging also would reduce the potential for sedimentation from harvested sites relative to conventional harvest methods. Similarly, the uneven-aged treatment would result in less visual alteration within the Thorne Island portion of the Whale Pass viewshed than would conventional harvest units. The proposed two-acre cuts would be less visible than the large conventional units. While visually disruptive to users of the waterway during periods of intensive harvest, the use of helicopters and barges would also eliminate visual impacts created by logging roads and the Log Transfer Facility.

Subsistence use would be less affected by the uneven-aged harvest approach than by conventional practices. Because no road construction would be required, there would be no increased access effects. The overall effects on subsistence resources would be minimal. Conventional harvest would reduce the deer population over the long term as a result of decreased habitat and increased hunting pressure. Hunting pressure would be expected to occur because road construction would facilitate access to the island interior (via motorcycles or ATV's).

Indirect effects to known cultural resources near the coast of Thorne Island would be minimized under the uneven-aged management plan because neither roads nor a Log Transfer Facility would be constructed. The conventional harvest approach could potentially affect a National Register-eligible site near the Log Transfer Facility; however, the use of current Log Transfer Facility standards and guidelines should prevent any direct effect.

The uneven-age management plan would result in lower impacts to all resources during the first entry and subsequent entries while resulting in slightly higher costs per thousand board feet harvested.

Mitigation Measures

The Forest Service uses numerous mitigation measures in the planning and implementation of land management activities. The application of these measures begins during the planning phases of a project. They link to the overall Forest, Ketchikan Area, and Ranger District management direction and continue through all phases of subsequent forest management. Standards, guidelines, and direction contained in the current TLMP, the Alaska Regional Guide, and applicable Forest Service manuals and handbooks have been applied in the development of alternatives and the design of harvest units and roads. Draft standards, guidelines, and direction contained in the TLMP Draft Revision (1991a) have also been used. Each alternative is designed to be consistent with the current TLMP and Alaska Regional Guide.

Planning for the Lab Bay Project was completed prior to issuance of the 1996 TLMP Draft Revision. The 1996 TLMP Draft Revision standards and guidelines are consistent, in general, with the 1991 Draft Revision Alternative P standards and guidelines.

The analysis supporting this EIS discloses possible adverse impacts that are specific to the locality and to the actions proposed. Therefore, specific measures were formulated to mitigate these impacts guided by the proposed land use designation management prescription, and by following Best Management Practices of the Soil and Water Conservation Handbook (USDA Forest Service 1991) and the Forest-wide standards and guidelines. Most of these measures are harvest unit or road specific, but many of these measures result in the complete elimination or deferral of harvest from geographic areas. These broad measures are identified and discussed first, followed by a summary of the site-specific measures.

Landscape Level Mitigation Measures

Establishment of harvest units within certain geographic areas was deferred, at least for the current proposed entry. A summary of the areas avoided and the reason for their deferral is provided below:

1) Harvest activities and road building were limited within the proximity of Calder Bay due to past harvest in the area and the cumulative visual disturbance.

2) Harvest activities and road building were limited near Port Protection and Point Baker due to extensive past harvest in the area and resource concerns derived from scoping comments.

3) Harvest activities and road building were avoided within the Flicker Creek drainage and limited in the Alder Creek drainage due to the cumulative watershed disturbance and extensive past harvest within the Flicker and Alder Creek watersheds.

4) Road building activities were avoided and harvest opening size reduced on Thorne Island for Alternatives 4 and 6 in order to reduce the multi resource impacts. Visual and subsistence concerns derived from scoping comments relative to this area were high.

5) Visual resources were given special consideration during planning of harvest activities within the Red Bay and Red Bay Lake areas.

6) The major project-specific mitigation measures for subsistence have been incorporated into the transportation plan as road closures. Roads have potential direct and indirect effects upon subsistence resource use. They affect the direct abundance and distribution of resources by their construction. The increased access can also increase the harvest of subsistence resources. This increased access also has the indirect effect of increasing competition for these subsistence resources.

Site-Specific Mitigation Measures

A wide variety of site-specific mitigation measures have been evaluated and incorporated into harvest unit and road design. These measures are summarized in Table 2-4 along with the number of harvest units affected for each alternative. A listing of each unit incorporating specific measures is provided in Appendix C. A description of the mitigation measures for each unit and road segment is provided in the unit and road design cards (See Planning Record).

In addition to the site-specific measures listed in these tables, a variety of other site-specific measures are incorporated into all harvest and road construction activities and would be incorporated as standard clauses in the specifications of all timber sale and road construction contracts. These measures include all appropriate BMP's not specifically identified in the table. Direction for use of BMP's on National Forest System lands in Alaska is included in Chapter 10 of the Region 10 Soils and Water Conservation Handbook (USDA Forest Service 1991). The handbook describes the application, monitoring, evaluation, and refinement of these BMP's. Standards and guidelines of the TLMP Draft Revision (1991a) are incorporated by reference.

Table 2-4
Site-Specific Mitigation Measures Incorporated Into Unit and Road Design

Mitigation Measure	Description	No. of Units Affected in Each Alternative 2	3	4	5	6
Karst						
K1	Geotechnical investigation, including dye tracing required to evaluate potential adverse effects on recharge area to domestic water supply.	2	0	0	2	0
K2	Modify unit boundary to avoid slopes in excess of 70% or to retain areas of greater than 70% on recharge area to domestic water supply.	12	0	5	8	0
K3	Achieve partial suspension due to steep slopes and/or thin soils on karst.	7	0	4	5	0
K4	Individual tree selection (Harvest Type I) due to high density of significant karst features (caves, vertical shafts, sinkholes, or insurgences).	12	0	3	9	0
K5	Avoid yarding over significant features (caves, vertical shafts, sinkholes, or insurgences).	12	1	8	7	2
K6	Maintain minimum 100-foot windfirm buffers around caves, vertical shafts, and other significant karst features.	34	0	20	21	2
K7	Directionally fall away from significant karst features (caves, vertical shafts, sinkholes, or insurgences)	17	1	7	12	2
K8	Ketchikan Area karst resource specialist should review unit during final layout.	36	1	21	23	3
Roads on Karst						
Kr1	Geotechnical investigation including dye tracing required to evaluate potential adverse effects of road construction on recharge area to domestic water supply.	2	0	0	2	0
Kr2	Geotechnical investigation required to evaluate potential adverse effects of blasting on significant karst features, or to determine stability of road across karst.	4	0	2	3	0
Kr3	Avoid filling or channeling of road drainage into caves, vertical shafts, sinkholes, or insurgences.	18	1	12	9	1
Kr4	Avoid construction over significant karst features (caves, vertical shafts, sinkholes, or insurgences).	14	0	10	8	1
Kr5	Realign road to avoid significant features (caves, vertical shafts, sinkholes, or insurgences).	2	1	1	2	1
Kr6	Road eliminated due to karst concerns.	2	1	2	1	1
Kr7	Proposed road located on moderate or low vulnerability karst is not expected to adversely affect significant karst features. Ketchikan Area karst specialist should review the final road location and design to ensure protection of water quality. Protection measures may include avoiding construction over karst features, prohibiting water diversion to or from	4	1	4	3	3

Table 2-4 (Continued)
Site-Specific Mitigation Measures Incorporated Into Unit and Road Design

Mitigation Measure	Description	No. of Units Affected in Each Alternative 2	3	4	5	6
	karst features, culvert placement and density, sediment retention, erosion prevention, or restrictions on blasting locations.					
Minerals						
M1	Protect all known mineral improvements, such as mine claim markers.	1	1	1	1	0
M2	Reasonable access will be provided for mining claims.	6	5	6	6	3
Fish, Water Quality, and Soils						
F1	Modify unit boundaries/design to avoid very high mass movement areas and areas dominated by thin organic soils, or to minimize soil displacement, erosion, and sedimentation into streams. (BMP's 13.2, 13.5)	63	40	41	42	27
F2	Avoid road construction in areas of very high mass movement potential (BMP's 14.2, 14.7).	2	2	0	1	1
F3	Require partial to full suspension logging systems to minimize high mass movement potential, and implement measures to minimize soil disturbance, erosion, or sedimentation into streams including seeding, slashing, or other stabilization measures (BMP's 12.7, 13.5, 13.7, 13.9, 13.12).	62	43	42	41	30
F4	Modify logging system to avoid or minimize damage to designated streams, muskegs or other wetlands (BMP's 12.5, 13.2, 13.3, and 13.15).	23	14	17	14	4
F5	Establish no-harvest and selective-cut buffers a long streams and around lakes to protect riparian management areas, fisheries, or for protection of temperature sensitive streams (BMP 12.6).	44	31	27	28	15
F6	Require split yarding and/or directional felling along selected Class III streams without buffers to maintain streambank stability and prevent sedimentation into stream channel (BMP 13.16).	23	19	13	17	12
F7	Implement measures to reduce surface erosion and drainage interruption related to transportation including water barring and cross-draining roads using ditches and culverts to prevent water running long distances over roads, closure, seeding and fertilizing cut and fill slopes, and locating and designing landings for good drainage and dispersion of water (BMP's 12.7, 12.11, 13.10, 14.3, 14.5, 14.8, 14.9, 14.10, 14.11. 14.12, 14.13)	46	29	35	31	24
F8	Establish timing restrictions for instream road construction activities for protection of anadromous and resident fish in Class I, Class IIa, and other designated streams. Includes in channel operations, stream crossings on temporary roads, bridge and culvert design and installation. (BMP's 14.6, 14.10, 14.14, 14.16, 14.17).	43	24	27	30	16
F9	Implement BMP's for protection of water quality, riparian areas, and fisheries habitat on all stream crossings including riparian area protection, streambank protection, stream channel protection, road closure, and timely implementation of erosion control measures (BMP's 12.6, 12.7, 12.11, 13.16, 14.9, 14.11).	49	28	32	31	20
F10	Retain timber within High Grandient Contained stream RMA's within and adjacent to units to avoid exceedance of HGC harvest threshold.	11	9	4	10	3
Vegetation and Timber						
T1	Conduct partial-cut harvesting to provide shelter and retain a seed source in the unit, and/or to help maintain the cedar component in the future stand.	5	5	4	3	4

Table 2-4 (Continued)
Site-Specific Mitigation Measures Incorporated Into Unit and Road Design

Mitigation Measure	Description	No. of Units Affected in Each Alternative 2	3	4	5	6
T2	Retain at least 2 yellowcedar trees per acre to provide an additional seed source within the unit.	18	18	1	18	1
T3	Implement measures such as retention areas or partial cutting to reduce regeneration concerns due to high elevation, low site productivity, shallow or saturated soils.	14	4	6	10	2
Wildlife						
W1	Provide for greater structural diversity on a stand level by retaining a minimum level of snags and green tree replacements. Typically, the minimum level will be met by retaining trees along unit boundaries and between settings where conditions allow. Identified for third and fourth order watersheds thatcurrently meet or exceed the minimum snag density guidelines, and are not adjacent to extensive past harvest (Concern Level 1).	97	61	57	67	36
W2	Provide for greater structural diversity on a stand level by retaining a minimum level of snags and merchantable green tree replacements throughout the rotation. Typically, the minimum level will be met by retaining trees along stand edges and between setting boundaries, or within leave tree islands where conditions allow. Identified for third and fourth order watersheds that are at or near the minimum snag density guideline, or are adjacent to extensive past harvest (Concern Level 2).	18	15	12	12	8
W3	Provide for greater structural diversity on a stand level by retaining a minimum level of snags and merchantable green tree replacements throughout the rotation. Typically, the minimum level will be met by retaining leave tree islands or by partial cut prescription where conditions allow. Identified for third and fourth order watersheds that are currently below the minimum snagdensity guideline, or are adjacent to extensive past harvest (Concern Level 3).	9	6	9	5	3
W4	Restrict the timing of helicopter logging and/or helicopter flight paths and road construction blasting near bald eagle nest sites when occupied. During final layout identify those eagle nests that are in close proximity to harvest units and ensure maintenance of buffer zones.	16	10	11	12	4
W5	Harvest units that are within high probability goshawk habitat or where past sightings have occurred. In 1995, goshawk surveys were conducted for 48 units, including high probability and past sighting units. Implement Region 10 management guidelines per 1996 TLMP Draft Revision, as appropriate, if nesting is identified.	41	36	24	28	15
W6	Implement road closures immediately after harvest to minimize human disturbance to wildlife and road access by hunters in specific areas.	104	74	67	70	39
W7	Evaluate potential for disturbance and restrict harvest and road construction activities in areas and during time periods when Vancouver Canada Goose nesting or trumpeter swan wintering may be disturbed.	18	13	13	9	7
W8	Consult with District Wildlife Biologist regarding timing of harvest and road construction.	3	3	1	3	1
W9	Restrict Forest Service authorized boat traffic and aircraft flights in the vicinity of the Steller sea lion haulout at Kasaan Point on Grindall Island.	*	*	*	*	*
W10	Restrict Forest Service authorized boat traffic and aircraft flights in the known vicinity of humpback whales and properly dispose of cables from	*	*	*	*	*

Table 2-4 (Continued)
Site-Specific Mitigation Measures Incorporated Into Unit and Road Design

Mitigation Measure	Description	No. of Units Affected in Each Alternative 2	3	4	5	6
	inactive LTF sites.					
Visual Resources						
V1	Modify boundary of harvest unit to meet proposed VQO's.	5	3	2	5	1
V2	Conduct partial cutting of unit to minimize visual contrast with adjacent areas.	6	4	4	5	4
V3	Leave behind all nonmerchantable trees after clearcutting to minimize visual contrast with adjacent areas.	1	0	2	0	1
V4	Conduct partial cutting along harvest unit and setting boundaries to reduce visual contrast with adjacent areas.	10	6	6	9	3
V5	Manage views by maintaining islands or strips of trees to visually screen harvest units from saltwater or roadside where appropriate.	22	11	9	16	2
Cultural Resources						
C1	Provide for mitigation of indirect effects to cultural resource sites near proposed harvest units and roads.	1	1	1	1	1

Source: Project Planning Record

* Applies to project level implementation

Monitoring

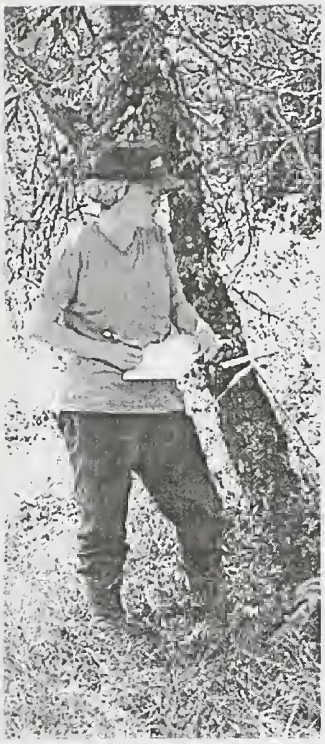
Monitoring activities can be divided into three broad categories: Forest Plan monitoring, routine implementation monitoring, and project-specific monitoring. These broad types are discussed in the following sections. Most monitoring associated with this project would be Forest Plan level monitoring; only activities or effects unique to the Lab Bay Area would be subject to project-specific monitoring.

Monitoring and evaluation provide the Forest officials with information on the progress and results of implementing Forest projects and activities. As such, monitoring and evaluation comprise an essential feedback mechanism to help respond to changing conditions.

Monitoring consists of measuring, on a sample basis, actual activities and their effects. Evaluation compares these results with projections contained in the Forest Plan, the Lab Bay EIS, and with public concerns. Where activities and effects are consistent with expectations and respond to public concerns, these results will be documented and implementation of the practices will continue. Where activities and effects are not consistent with exceptions, further analysis will be done to identify what corrective action needs to be taken.

Monitoring and evaluation is designed to determine the degrees to which:

- Planned outputs, goals, and objectives are being met.
- Public concerns are being addressed.
- Standards and guidelines are being followed.
- Standards and guidelines achieve the expected results.



A field resource inventory was conducted for each potential harvest unit, adjacent areas, and associated roads.

Relationship between Project Monitoring and Forest Plan Monitoring

Implementation, effectiveness, and validation monitoring are performed at the Forest Plan level. For the Lab Bay Project, this monitoring will occur under the Ketchikan Area Monitoring Strategy (USDA Forest Service 1994a). The Ketchikan Area Monitoring Strategy provides detailed procedures for conducting routine implementation monitoring, to determine whether BMP's and other actions were implemented as specified in unit and road cards. In addition, the strategy describes the process used to develop longer-term effectiveness monitoring questions and procedures, focusing on whether implementation of actions achieved the desired results.

The Lab Bay Project contributes to the Ketchikan Area Monitoring Strategy in three ways. First, the unit and road cards specify mitigation measures and BMP's to be implemented, providing the basis for routine implementation monitoring. Second, the Project Resource Reports identify proposed units and roads that could be selected by the Ketchikan Area for implementation of effectiveness monitoring. Finally, the EIS describes monitoring opportunities that are unique to the Lab Bay Project, and identifies objectives, methods of measurement, and staff responsible for performing the monitoring.

Project-specific monitoring is intended only to supplement the monitoring requirements developed for the Forest Planning processes. Although there will be some overlap between monitoring requirements of projects and the Forest Plan, no single project is expected to address all of the monitoring questions listed in the Forest Plan. On the other hand, some projects may impose monitoring requirements not included in the Forest Plan, in response to site-specific concerns. Taken as a whole, however, monitoring plans for all projects should be designed to answer the questions proposed in the Forest monitoring plan, so that wherever possible, the Forest Plan's monitoring requirements can be met by compiling the results of project monitoring.

Types of Monitoring

There are three distinct types of monitoring: implementation, effectiveness, and validation. Implementation monitoring determines if projects and activities comply with Forest Plan standards and guidelines. Effectiveness monitoring determines whether the standards and guidelines achieve the desired results. Validation monitoring determines whether the assumptions in the Forest Plan regarding the relationship between management actions and their effects are correct, or if there is a better way to depict these relationships.

Implementation Monitoring

Implementation monitoring is the most basic type of monitoring, in that the question it seeks to answer is "Are projects and activities being implemented in compliance with the standards and guidelines?" Implementation monitoring is usually conducted on a qualitative rather than quantitative basis. Therefore, it is the easiest and least expensive type of monitoring, yet it forms the basis for conducting the other types. Therefore, implementation monitoring may be the most important of the three, and needs to be conducted most often. Implementation monitoring is also the most common of the three monitoring types used at the project level.

Routine implementation monitoring assesses whether the project was implemented as designed and whether or not it complies with the Forest Plan. Planning for routine implementation monitoring began with the preliminary design of harvest units and roads. Specialists used on-the-ground inventories, computer inventories, and aerial photographs to prepare documents called unit cards for each harvest unit in each of the alternatives. Cards were also prepared for each segment of road. Resource specialists wrote their concerns on the cards and then described how the concerns could be addressed in the design of each unit and road segment. Integrated silvicultural prescriptions were prepared to describe the detailed interdisciplinary prescription for each unit. Resource concerns, mitigation measure, and prescriptions will be refined further during final layout when specialists will have one more opportunity to revise the unit and road card recommendations and integrated silvicultural prescriptions. The unit and road cards and prescriptions will be the basis for determining whether recommendations were implemented for various aspects of the Lab Bay Project.

Routine implementation monitoring is part of the administration of a timber sale contract. The sale administrators and road inspectors ensure that the recommendations contained on the unit and road cards and the prescriptions are incorporated into contract documents and then monitor performance relative to contract requirements.

Effectiveness Monitoring

Effectiveness monitoring normally can be conducted only after implementation monitoring has determined that projects and activities comply with the Forest Plan's standards and guidelines. It poses the question "To what extent does adherence to the standards and guidelines achieve the results expected?" In some cases, it may be possible to conduct implementation and effectiveness monitoring simultaneously, determining the extent to which standards and guidelines (1) were followed; and (2) worked as anticipated.

Like implementation monitoring, effectiveness monitoring can also be conducted, in some cases, on a qualitative basis. More often, however, effectiveness monitoring involves a quantitative examination of the effects of management activities. Because this type of monitoring may require a considerable amount of data, it is generally conducted on a limited basis dealing with sensitive areas and activities that pose moderate or high risk of adverse effects on Forest resources, or in response to public concerns.

Once effectiveness monitoring has proven that standards and guidelines are achieving the desired results when properly implemented, then repeated effectiveness monitoring is not needed and monitoring the implementation of standards and guidelines is all that is necessary.

Validation Monitoring

Validation monitoring is conducted to determine whether the initial data, assumptions, relationships, and models used in revising the Forest Plan are correct, or if there is a better way to meet Forest Plan objectives.

The questions posed by validation monitoring are: Are assumptions and resource relationships used in the Forest Plan correct? Is there a better way to meet Forest Plan goals and objectives? It is usually conducted when effectiveness monitoring results indicate basic assumptions or coefficients are questionable or where coefficients and standards are not reasonably substantiated by existing research. Items monitored are those with strong public interest, Forest Service concern, diversity of opinion, or those that have the potential to be under or overly restrictive. Validation monitoring may be data-intensive and may require long-term investigations. As is the case for effectiveness monitoring, validation monitoring is not expected to be repeated during the planning period once valid results are obtained.

Project-Specific Monitoring

In addition to the Forest Plan monitoring and routine implementation monitoring that will be conducted throughout the Tongass National Forest, seven Project-specific monitoring activities are identified. Each is unique to the Lab Bay Project Area and normally would not be included in Forest Plan or routine implementation monitoring. The following provides a description for each Project-specific monitoring activity.

Thorne Island Uneven-Aged Management Plan

Objective: To determine if uneven-age management provides the required regeneration success, desired species composition, and meets the required visual quality objectives.
Desired Result: Successful regeneration of desired species and maintenance of existing visual quality objectives.
Measurement: Evaluate harvest units three years after harvest to verify regeneration success and document species composition. Compare before and after visual perspective photos to visual management guidelines.
Evaluation: Determine if regeneration and visual objectives were achieved and can continue to be achieved for future harvest entries.
Responsible Staff: Thorne Bay District silviculturist and landscape architect.
Record of Results: Prepare a brief report of results.

Port Protection and Whales Resort Watersheds

Objective: To prevent significant decrease in water quality for the residents of Port Protection and the Whales Resort area in alternatives proposing harvest of Units 527-206, 527-226, and 538-10.
Desired Results: No change in water quality during harvest of Units 527-206, 527-226 and 538-210.
Measurements: Sample and record water quality attributes before, during, and shortly after the completion of timber harvest to ensure that State water quality standards are maintained.
Evaluation: Verify that State water quality standards are being achieved.
Responsible Staff: Thorne Bay Ranger District Staff.
Record of Results: Report findings to Supervisor's Office and to the community of Port Protection and residents of the Whales Resort area.

Port Protection Wind Patterns

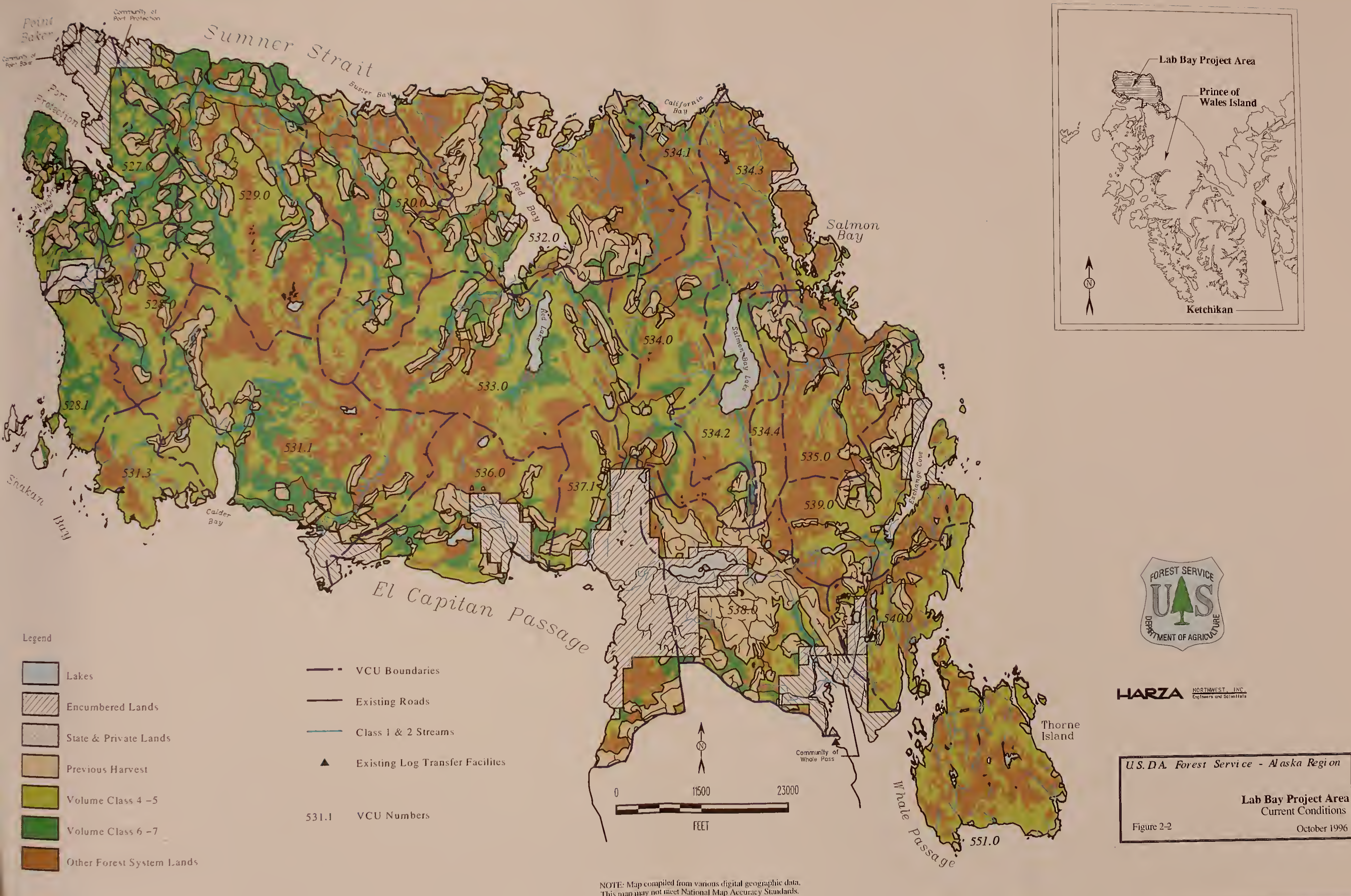
Objective: To ensure that timber harvest on Protection Head does not adversely change wind patterns intensity at Port Protection (Units 527-227, 527-228, 527-229).
Desired Result: Harvest activities do not change wind patterns and wind intensity at Port Protection.
Measurement: Record wind direction and wind speed at Port Protection and control locations before, during, and after timber harvest activities.
Evaluation: Identify factors influencing wind patterns and make recommendations concerning future harvesting on Protection Head.
Responsible Staff: Thorne Bay Ranger District.
Record of Results: Prepare a brief report of results for District Ranger.

Karst Resources

Objective: To prevent significant or permanent adverse effects to karst resources as the result of surface management activity and determine if implemented protection measures were effective.
Desired Results: Surface management activities will not have an adverse affect on karst resources and hydrology.
Measurement: Conduct field inspections on at least 25 percent of surface management activities on high vulnerability karst.
Evaluation: Determine if mitigation was successful in avoiding any significant or permanent adverse effects to karst resources.
Responsible Staff: Forest Geologist in coordination with the Thorne Bay Ranger District.
Record of Results: Report of results to Forest Supervisor.

Ecosystem Management

Objective: To determine if the different harvest methods prescribed in this project have been implemented and appear to be effective.
Desired Result: All types of harvest methods have been implemented and appear to be effective at maintaining structure in second-growth stands for wildlife and reducing the visual contrast between the harvest unit and adjacent unharvested stands.
Measurement: Compare unit cards and silvicultural prescriptions with observations on the ground on 20 percent of the units. Prepare narrative description and map of reserve tree size, density, and distribution.
Evaluation: Modify future unit prescriptions based on the feedback obtained.
Responsible Staff: Thorne Bay Ranger District wildlife staff and landscape architect.
Record of Results: Prepare a brief report of results for District Ranger.


Sumner Strait
Point Baker
Community of Point Baker
Community of Port Protection
Port Protection
Buster Bay
California Bay
Red Bay
Red Lake
Salmon Bay
Salmon Bay Lake
Exchange Cove
Snakan Bay
Calder Bay
El Capitan Passage
Whale Passage
Thorne Island
Community of Whale Pass
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Lab Bay Project Area
Prince of Wales Island
Ketchikan
Legend
Lakes
Encumbered Lands
State & Private Lands
Previous Harvest
Volume Class 4 -5
Volume Class 6 -7
Other Forest System Lands
VCU Boundaries
Existing Roads
Class 1 & 2 Streams
Existing Log Transfer Facilites
531.1 VCU Numbers
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FOREST SERVICE
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Lab Bay Project Area
Current Conditions
Figure 2-2
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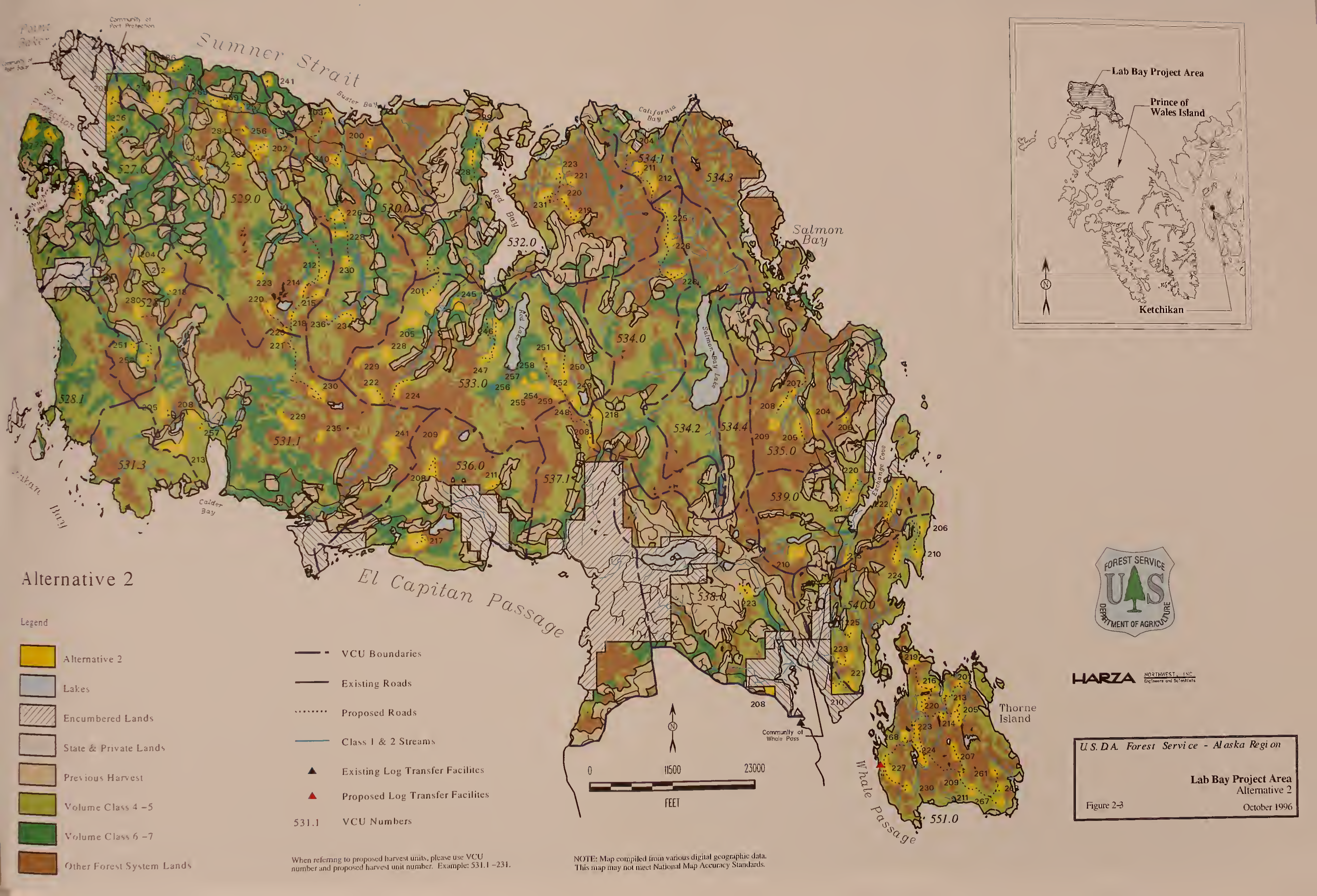
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Alternative 2
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Alternative 2
Lakes
Encumbered Lands
State & Private Lands
Previous Harvest
Volume Class 4 - 5
Volume Class 6 - 7
Other Forest System Lands
VCU Boundaries
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Proposed Roads
Class 1 & 2 Streams
Existing Log Transfer Facilites
Proposed Log Transfer Facilites
531.1 VCU Numbers
When referring to proposed harvest units, please use VCU number and proposed harvest unit number. Example: 531.1 - 231.
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FEET
NOTE: Map compiled from various digital geographic data. This map may not meet National Map Accuracy Standards.
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Lab Bay Project Area
Alternative 2
Figure 2-3
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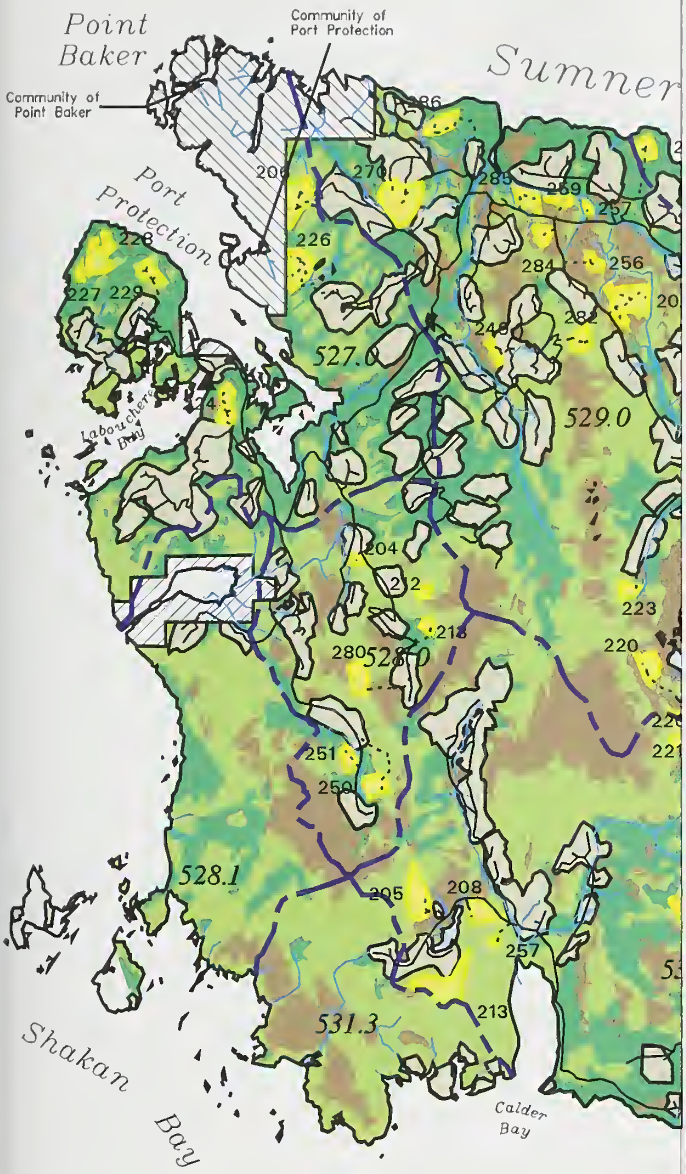
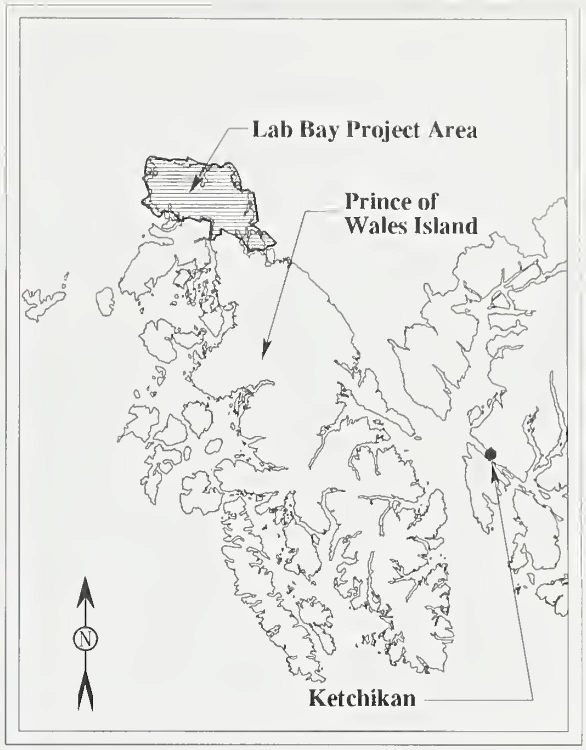


Alternative 2

Legend

- Alternative 2
- Lakes
- Encumbered Lands
- State & Private Lands
- Previous Harvest
- Volume Class 4 –5
- Volume Class 6 –7
- Other Forest System Lands



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Lab Bay Project Area
Alternative 2

Figure 2-3

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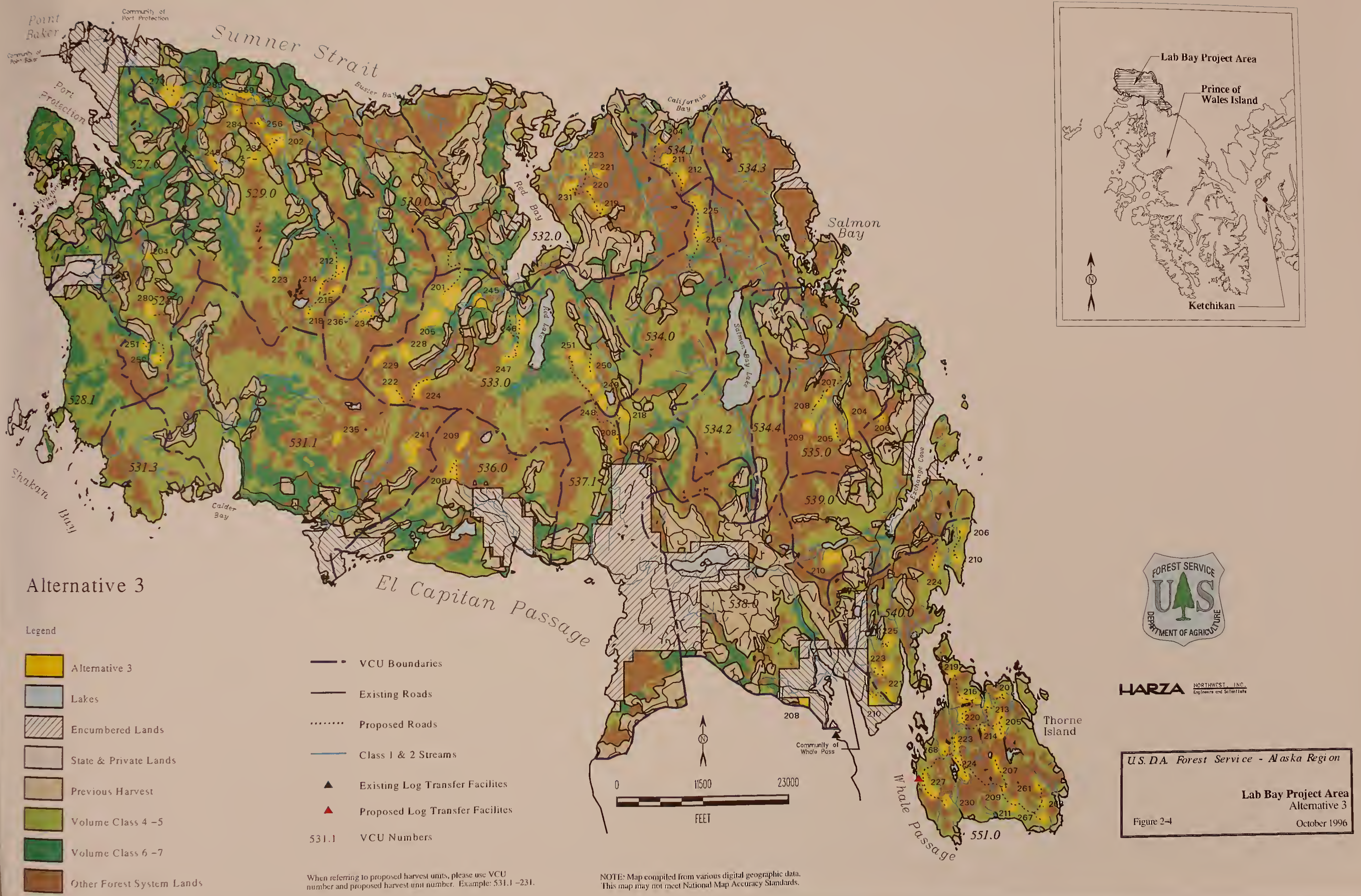

Point Baker
Community of Port Protection
Community of Point Baker
Sumner Strait
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Lab Bay Project Area
Prince of Wales Island
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State & Private Lands
Previous Harvest
Volume Class 4 -5
Volume Class 6 -7
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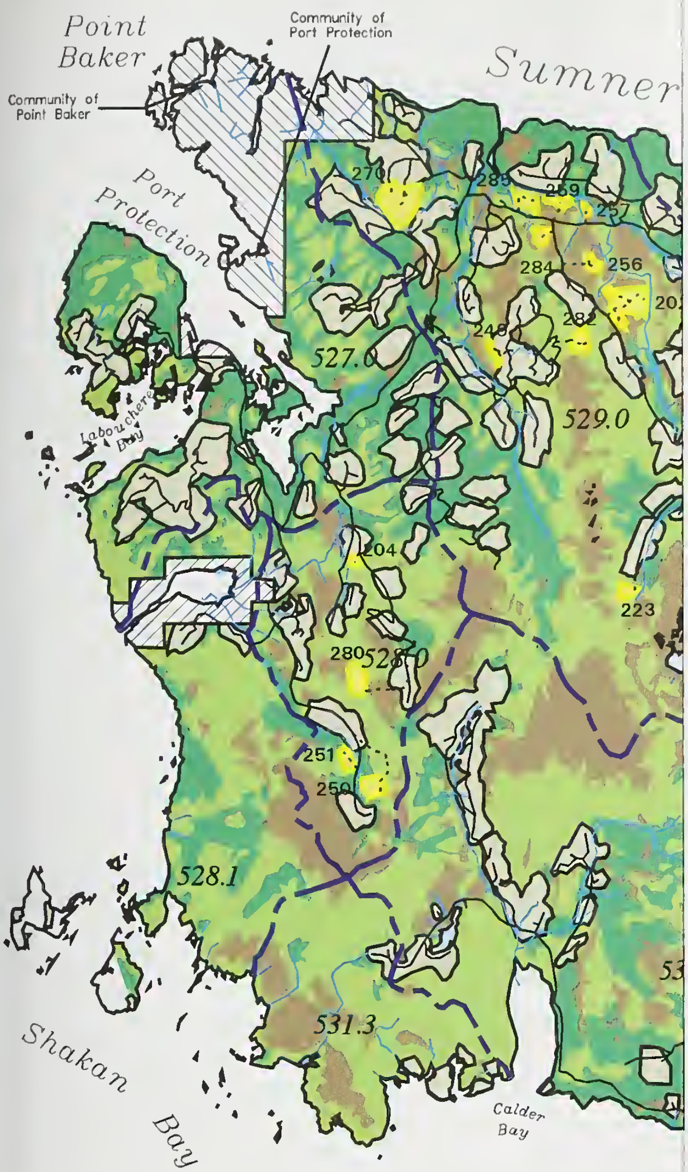
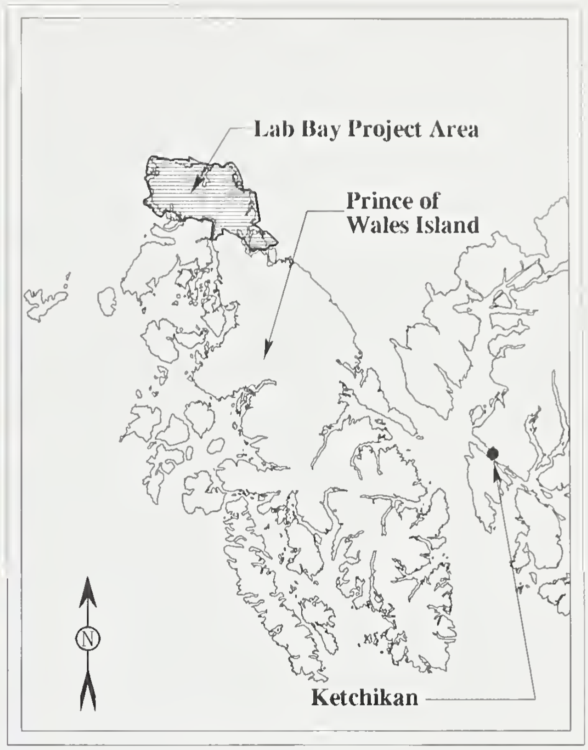
U.S. D.A. Forest Service - Alaska Region
Lab Bay Project Area
Alternative 3
Figure 2-4
October 1996



Alternative 3

Legend

- Alternative 3
- Lakes
- Encumbered Lands
- State & Private Lands
- Previous Harvest
- Volume Class 4 –5
- Volume Class 6 –7
- Other Forest System Lands



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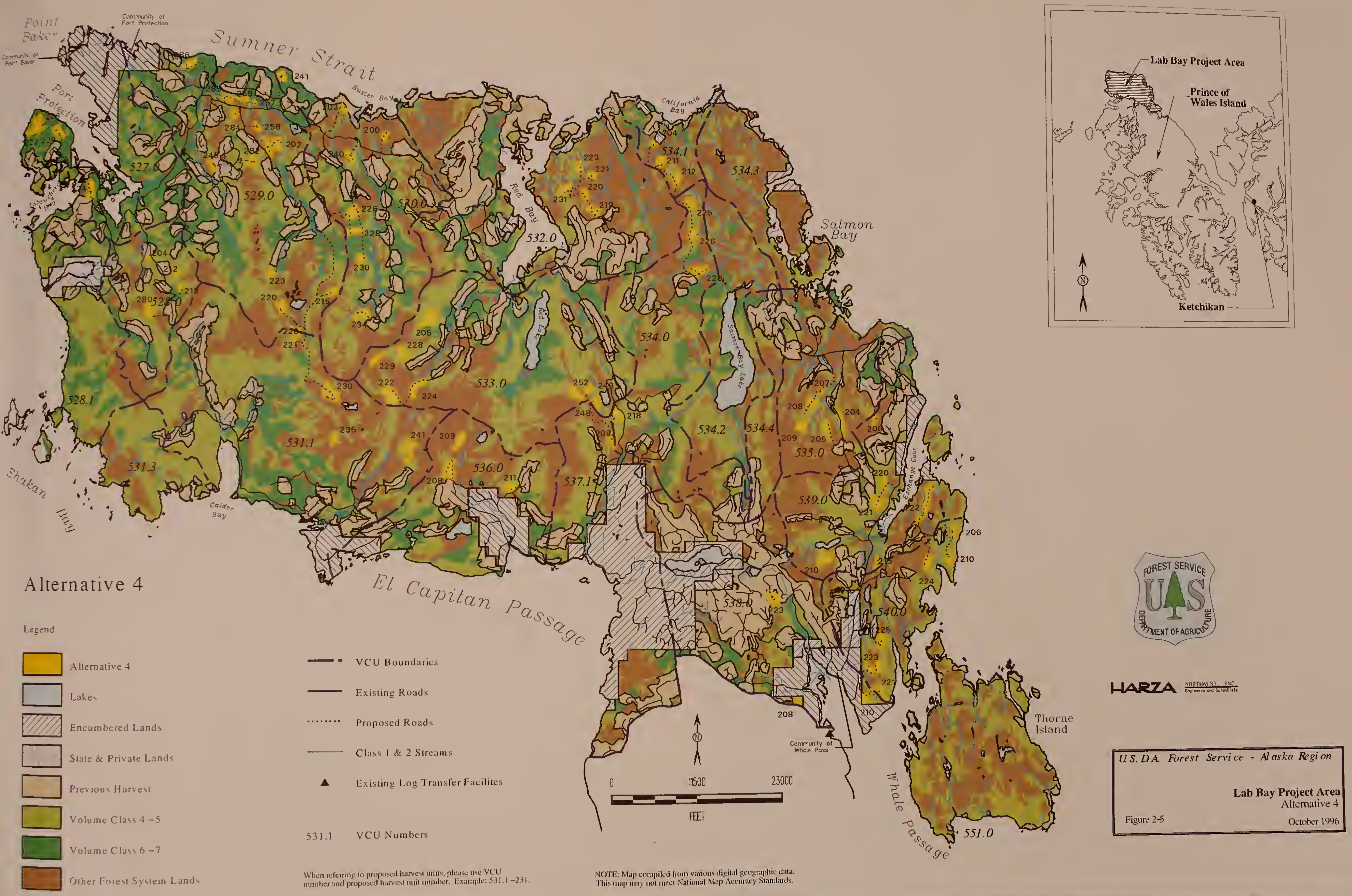
Lab Bay Project Area
Alternative 3

Figure 2-4

October 1996



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U.S.D.A. Forest Service - Alaska Region
Lab Bay Project Area
Alternative 4
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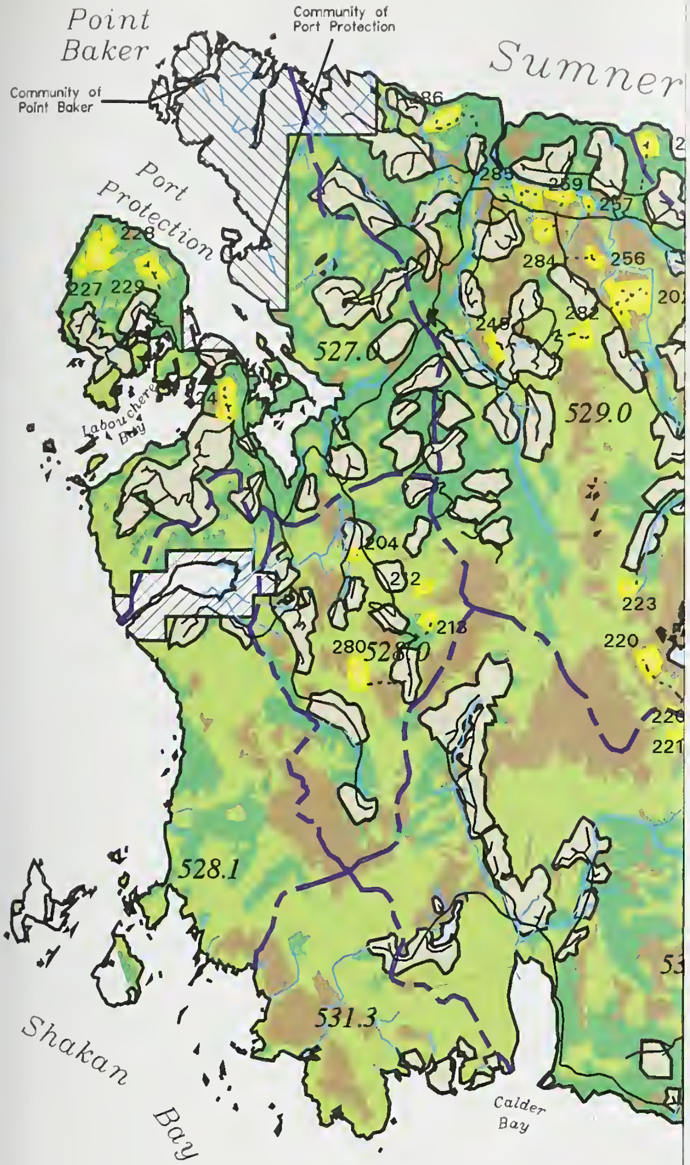

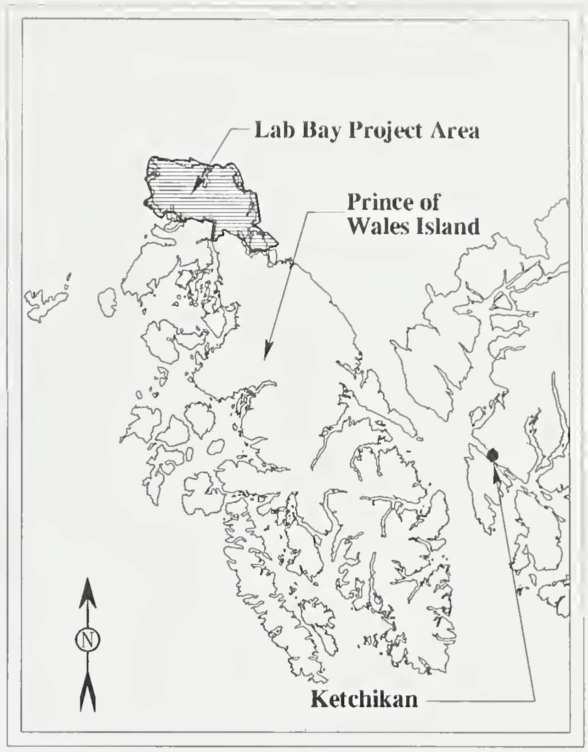

Alternative 4

Legend

- Alternative 4
- Lakes
- Encumbered Lands
- State & Private Lands
- Previous Harvest
- Volume Class 4 –5
- Volume Class 6 –7
- Other Forest System Lands

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Lab Bay Project Area
Alternative 4

Figure 2-5

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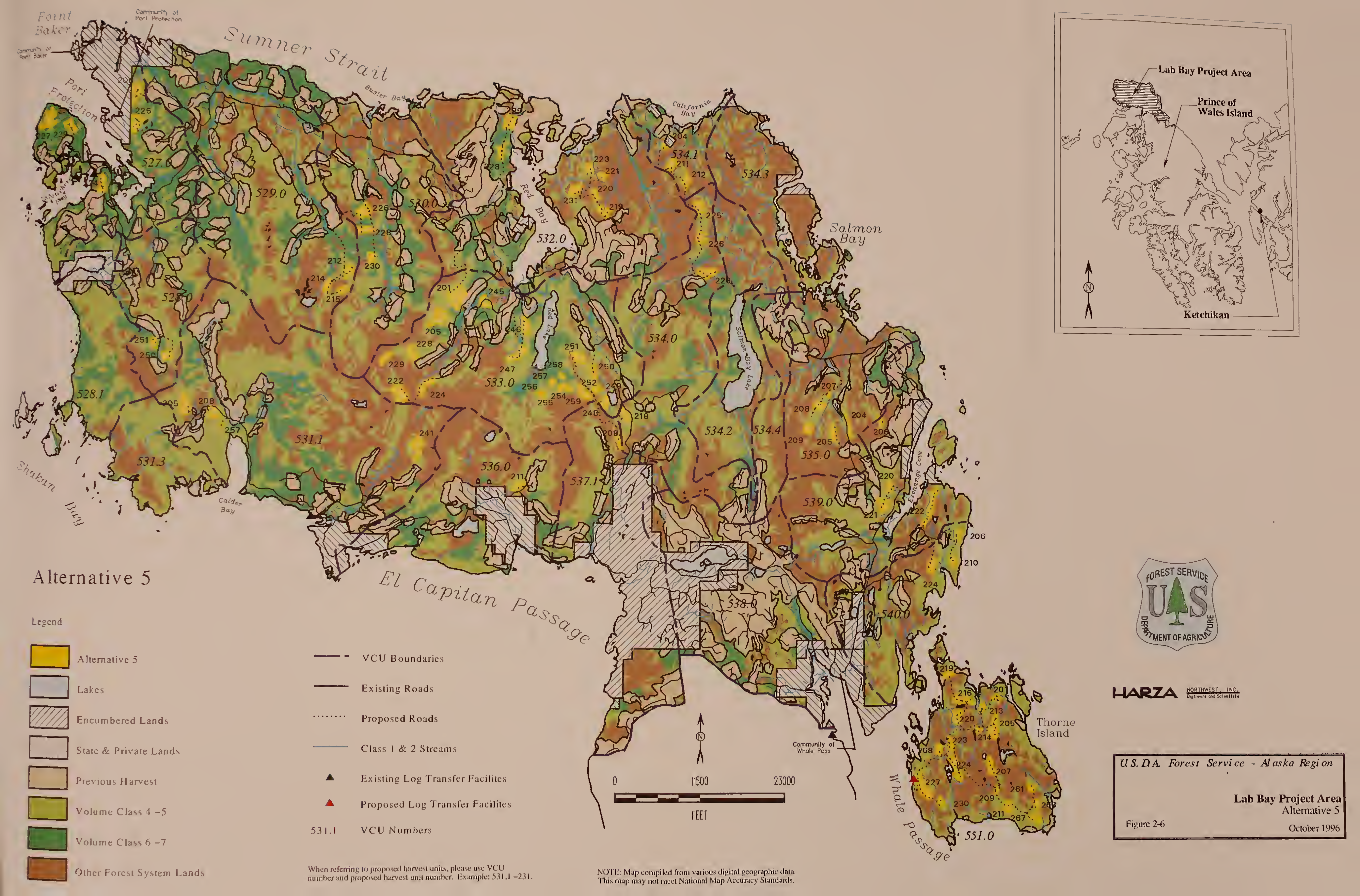

Point Baker
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Lab Bay Project Area
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Lab Bay Project Area
Alternative 5
Figure 2-6
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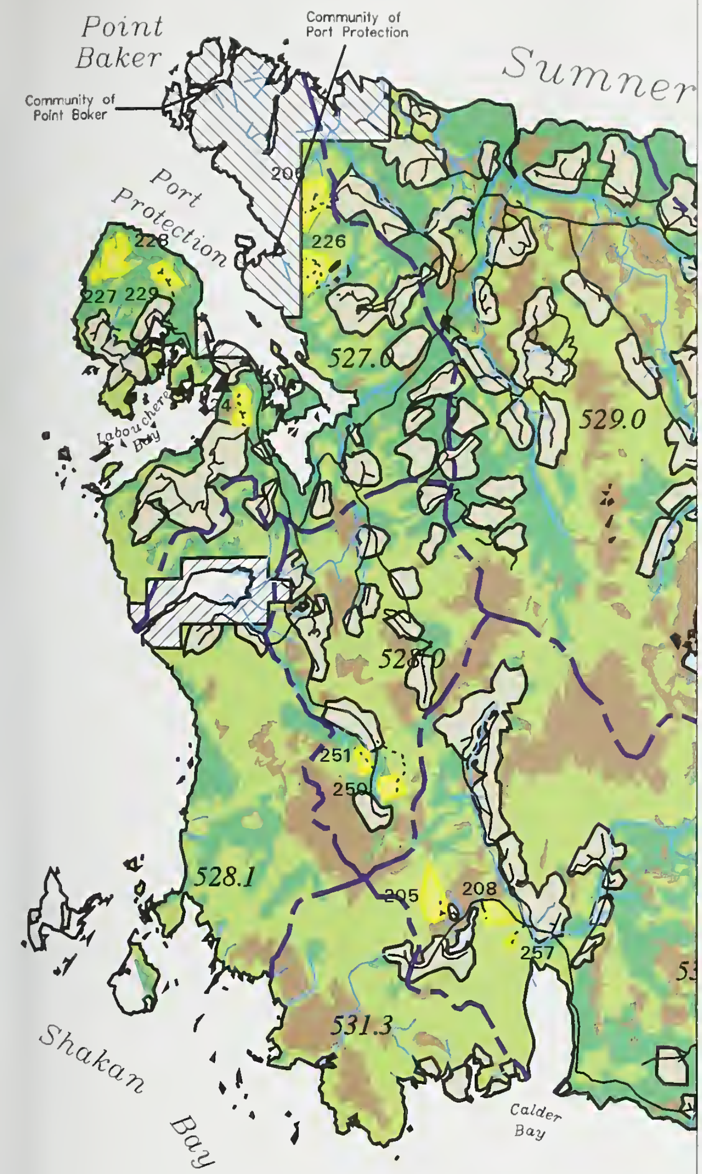

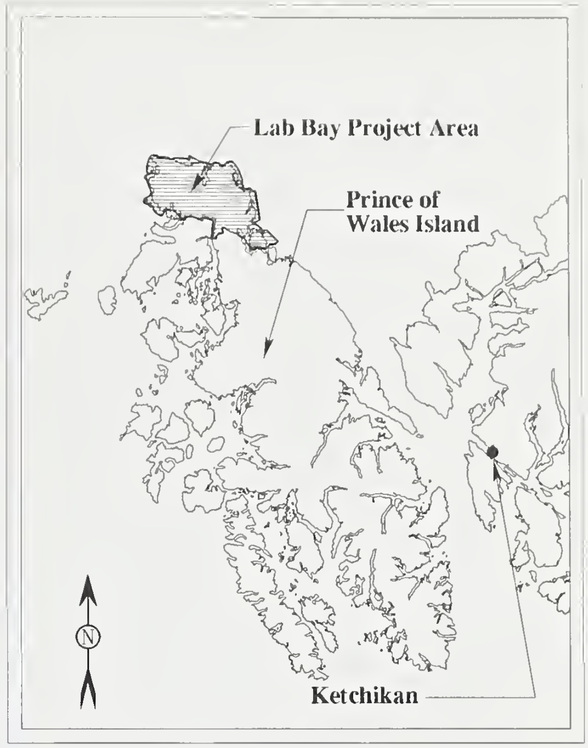

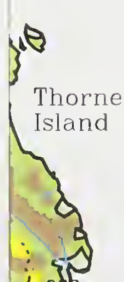

Alternative 5

Legend

- Alternative 5
- Lakes
- Encumbered Lands
- State & Private Lands
- Previous Harvest
- Volume Class 4 – 5
- Volume Class 6 – 7
- Other Forest System Lands

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Alternative 5

Figure 2-6

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Alternative 6

Figure 2-7

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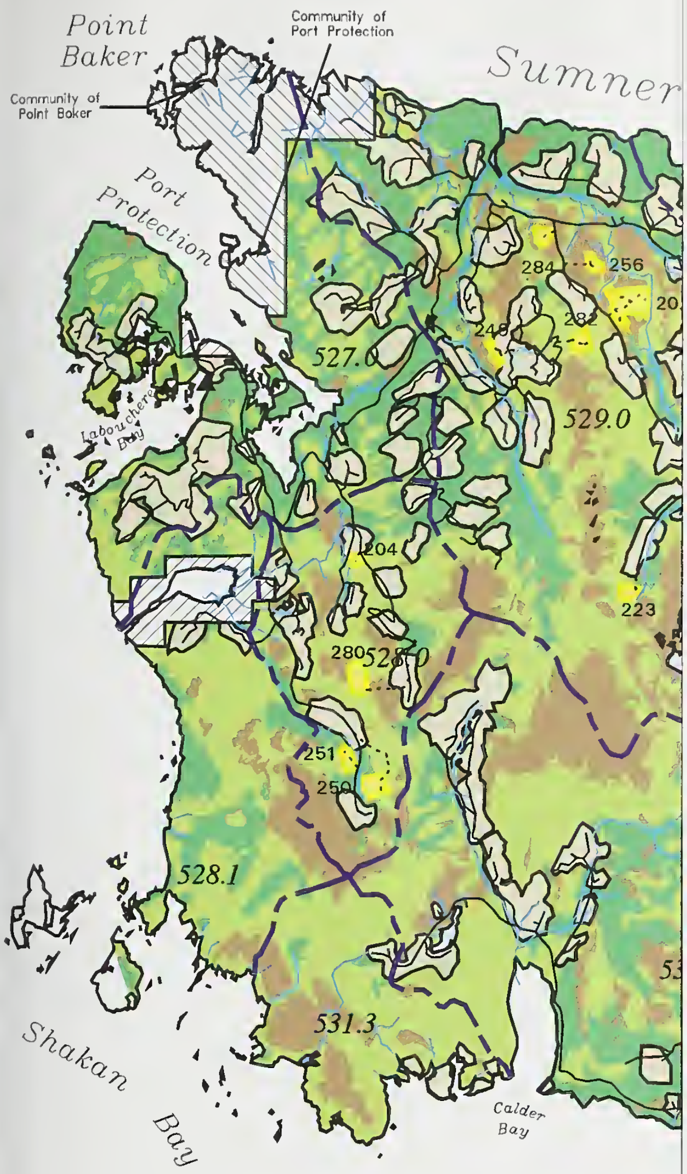
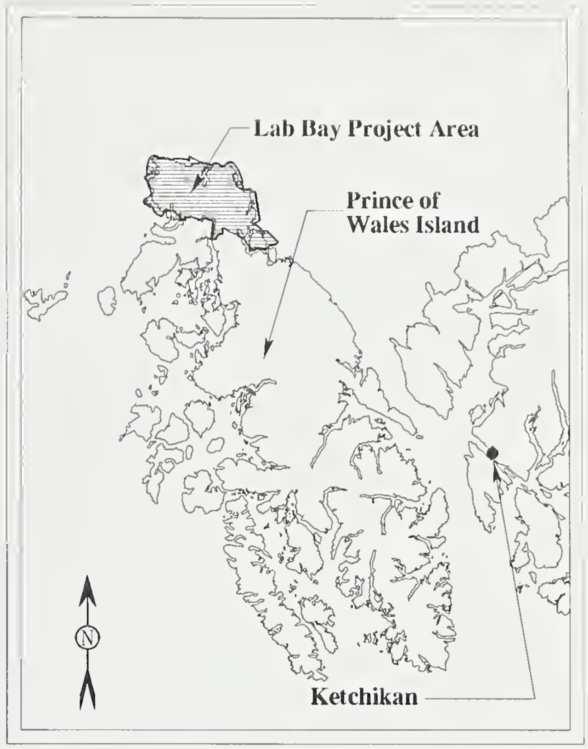
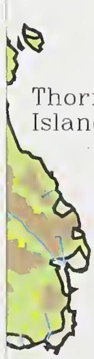


Alternative 6

Legend

- Alternative 6
- Lakes
- Encumbered Lands
- State & Private Lands
- Previous Harvest
- Volume Class 4 –5
- Volume Class 6 –7
- Other Forest System Lands





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Lab Bay Project Area
Alternative 6

Figure 2-7

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Chapter 3

Affected Environment and Effects of the Alternatives

Chapter 3
Affected Environment and Effects of the Alternatives

Introduction

This chapter describes the environmental resources of the Lab Bay Project Area that would be affected by each of the timber harvest alternatives if they were implemented. This chapter also describes the probable consequences of each alternative on the environmental resources of the area. Included by resource is a discussion of the existing condition of that resource and trends apparent from data that was collected; the potential direct, indirect, and cumulative effects of each alternative on the resource; and the scientific or analytic basis for these assessments. To adequately address connected actions and cumulative effects, the analysis of some resources extended beyond the boundary of the Project Area. Chapter 3 provides the technical basis for the Comparison of Alternatives presented in Chapter 2.

Resources are described in the following sequence in this Chapter:

- Physical Factors
  - Air Quality
  - Geology, Minerals, and Karst Resources
  - Soils
  - Water Resources
  - Floodplains, Wetlands, and Riparian Areas
- Biological Factors
  - Fisheries
  - Silviculture, Timber, and Vegetation
  - Wildlife, Old Growth, and Biodiversity
  - Threatened, Endangered, and Sensitive Species
- Social Factors
  - Land Use
  - Transportation, Logging, and Facilities
  - Socio-Economics
  - Subsistence
  - Cultural Resources
  - Visual Resources
  - Recreation
  - Other Environmental Considerations

Available Information

There is less than complete knowledge about many of the relationships and conditions of wildlife, fish, forests, jobs, and communities. The ecology, inventory, and management of a large forest area is a complex and developing science. The biology of wildlife species prompts questions about population dynamics and habitat relationships. Analyzing the interaction of resource supply, the economy, and communities is an inexact science.

The interdisciplinary team (ID Team) examined the data and relationships to estimate the effects of the alternatives. When encountering a gap in information, the ID Team concluded that any missing information frequently could have added precision to estimates of an effect or a relationship. However, the basic data and central relationships are sufficiently well established that more information would be very unlikely to reverse or nullify understood relationships. Thus, any new information could add precision, but was not essential to provide adequate background on each alternative such that the decision-maker can make a reasoned choice.

Analyzing Effects

This project implements TLMP (1979, as amended) and is consistent with the TLMP Revision Supplement Draft EIS, Alternative P (USDA Forest Service 1991a). The Forest Plan discloses direct, indirect, and cumulative environmental impacts of timber harvest and road construction, and the Plan itself presents standards designed to mitigate them. Therefore, the TLMP (1979, as amended) or the TLMP Draft Revision (1991a) will be incorporated by reference (40 CFR 1502.21) for this project. Planning for this project was substantially completed prior to issuance of the 1996 TLMP Draft Revision. The project is consistent with the preferred alternative of the 1996 Draft Revision insofar as the preferred alternative is based on Alternative P of the 1991 Draft Revision.

Environmental consequences are the effects of implementing an alternative on the physical, biological, social, and economic environment. Direct environmental effects are defined as those occurring at the same time and place as the initial cause or action. Indirect effects are those that occur later in time or are spatially removed from the activity but would be important in the foreseeable future. Cumulative effects result from the incremental effects of actions when added to other past, present, and reasonable foreseeable future actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

The reasonably foreseeable time frame over which the indirect effects are estimated for the purposes of this analysis is until the end of the KPC contract (the year 2004).

The following assumptions were made to assess the reasonably foreseeable effects to the year 2004. These assumptions reflect current management and technology of national forests and provide a uniform approach to estimating effects of timber harvest and road construction.

- Laws, standards, guidelines, and Best Management Practices (BMP's) for water quality would be followed. These requirements are expected to be at least as stringent in the future as they are today.
- Timber sale planning would use an interdisciplinary process.
- All acres of suitable land as identified in Alternative P of the TLMP Draft Revision (1991a) would be equally subject to impacts.
- The No Action alternative would represent only a delay in implementing the TLMP and, based on volume projections in the ten year timber sale action plan, foreseeable cumulative effects would begin to occur before 2004.
- If the No Action alternative were implemented, future effects on resources from timber harvest and road construction would be similar to impacts projected for current action alternatives.

The cumulative effects analysis is extended to 2054 to show the effects of past, proposed, and scheduled harvest generally corresponding to the conversion of old growth to second growth management; and to 2140, showing the cumulative effects of harvesting suitable lands through the first rotation and halfway through the second.

Potential adverse environmental effects which cannot be avoided are discussed. Unavoidable adverse effects may result from managing the land for one resource at the expense of the use or condition of other resources. Many adverse effects can be reduced or mitigated by limiting the extent or duration of effects. Mitigation measures are specified for project activities to be implemented under the alternatives. These are discussed briefly throughout the chapter, and in detail in Chapter Two.

Land Divisions

Lands in the Tongass National Forest have been divided in several different ways to describe different resources and to analyze how they may be affected by Forest Plan and project level decisions. These divisions vary by resource. Some of the more frequently used terms are described below.

Management Areas

The Lab Bay area is subdivided into four Management Areas: K01 (Sumner), K02 (Salmon Bay), K03 (El Capitan - Whale Pass), and K03A (Mt. Calder - Mt. Holbrook). Management direction within both K02 and K03A emphasize preservation of existing conditions; no timber harvest activities are proposed within these designations. Management direction for K01 and K03 emphasize a variety of land use prescriptions, depending upon the specific land allocation and management objectives.

Value Comparison Units

The Project Area is further subdivided into 21 Value Comparison Units (VCU's). These are distinct geographic areas, each encompassing a drainage area of one or more large streams. VCU's are commonly used to describe locations of specific resources on the Project Area and to facilitate analysis and tracking of forest conditions.

Wildlife Analysis Areas

These divisions correspond to the minor harvest areas used by the Alaska Department of Fish and Game. Approximately 90 apply to the Tongass National Forest and 4 to the Lab Bay Project Area. WAA's are used in discussions of wildlife, fisheries, and subsistence.

Air Quality

Key Terms

Ambient Air - Air encompassing or surrounding a specific region..

Ambient Air Quality Standard - The prescribed level of pollutants in the outside air that cannot be exceeded legally during a specified time in a specified geographical area.

Class II Airshed - The second of three area classes in the Clean Air Act (Class I areas are the "cleanest"). Class II Airsheds have no specific criteria that must be met to attain and maintain ambient air quality standards.

Affected Environment

Climate

The Lab Bay Project Area is influenced by a maritime climate which brings precipitation nearly year-round. The dominant pressure cells, known as "Aleutian Lows", are spawned in the North Pacific by the Japanese current and cold Arctic downdrafts. Off-shoots of the cells move southeast into the Alaskan/British Columbia coastal area, bringing in relatively warm, moist air. These pressure cells produce strong winds and large amounts of precipitation when they encounter the coastline.

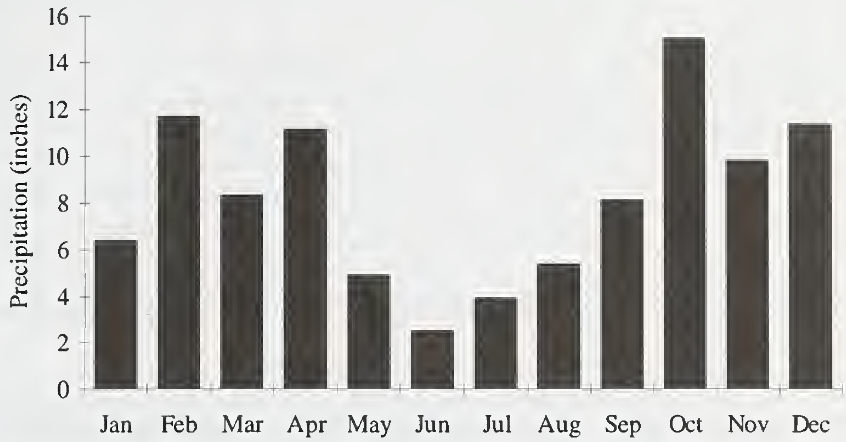
Precipitation has been measured by the US Geologic Survey at Craig, in the central portion of Prince of Wales Island, since 1949. Precipitation averages 87 inches per year, with the heaviest amounts between September and April.

Precipitation exceeds evapotranspiration in all months of most years. October is generally the wettest month, while May through July are the driest months (Figure 3-1). Snow accumulation below 500 feet in elevation is usually intermittent, melting off within a few days because of warmer temperatures and rain. Snowfall is most likely to occur in January and February.

The Pacific maritime influence holds the daily and seasonal temperatures within a relatively narrow range. Average monthly maximum temperature measured at Craig is 65 degrees F in August, while the average minimum monthly temperature is 22 degrees F in January (Figure 3-2).

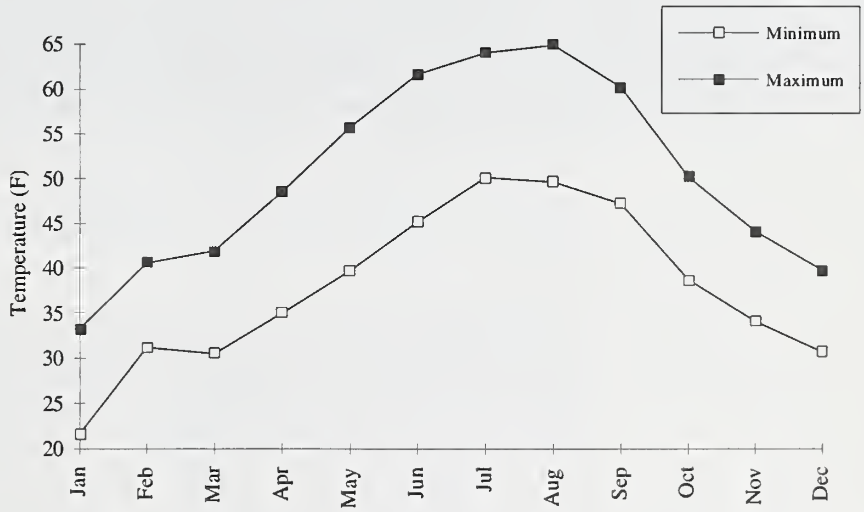
Air quality is generally considered to be good in the Lab Bay Project Area, helped in part by geographic location and the maritime climate.

Figure 3-1
Average Monthly Precipitation at Craig, 1949-1991



Source: Metzler 1993

Figure 3-2
Average Maximum and Minimum Temperature at Craig, 1949-1991



Source: Metzler 1993

Air Quality

Air quality is generally considered to be good in the Lab Bay Project Area and throughout most of the Tongass National Forest. Exchange of air typically comes from relatively pollution free air off the Gulf of Alaska. Local sources of airborne particulates include vehicle emissions, dust and residential and commercial heating in Labouchere Bay, Port Protection, and other small communities. Low population densities, a lack of non-forest-related industrial activities and increasingly limited use of site burning result in locally good air quality.

The State of Alaska Department of Environmental Conservation (DEC) has the primary responsibility for attainment and maintenance of ambient air quality standards under the provisions of the Clean Air Act (see TLMP Draft Revision 1991(a) for related air quality discussion). To date, DEC has classified the entire Tongass National Forest, including the Project Area as a Class II airshed. Class II airsheds do not have specific attainment criteria under the Clean Air Act. No Class I airsheds have been designated in the State of Alaska.

Effects of the Alternatives

It is unlikely that the proposed action alternatives would significantly change local or area air quality conditions. Direct air quality effects from forest management activities are temporary and limited in nature, resulting in dust and vehicular emissions from logging operations and smoke from a very limited prescribed fire program. Smoke from prescribed fires is managed by developing burning plans and prescriptions to minimize environmental effects upon air quality. Additionally, it is common to retain slash rather than to burn it to protect micro-habitat conditions and enhance seedling establishment. Thus, burning is done on a very limited basis. For the Lab Bay Project, no prescribed burning is anticipated nor is burning of slash recommended, thus implementation will not have any effect on particulate emissions resulting from burning of woody residue. Slash composed of non-merchantable logs, tops, and limbs will be scattered within the harvest units or along the road right of way. Large non-merchantable logs that remain at landing locations can be made available to the public for firewood upon completion of the timber sale.

Dust generated from road construction and increased vehicular traffic may temporarily affect air quality. The seasonally wet climate should reduce this affect over part of the year, although high dust levels can be expected during dry periods (May-August) when local traffic is heavy. Quantification of this temporary affect is not practical, given the minor role it would play on area conditions. Miles of new road associated with the various alternatives, miles of road recommended for closure following this entry and miles of road remaining open into the immediately foreseeable future are presented in the Transportation, Logging and Facilities section of this chapter.

Local disruption of wind patterns will occur as the overstory canopy is opened during harvest. These changes are expected to occur within and immediately adjacent to harvest units, occasionally causing wind throw of standing trees. Wind patterns over larger areas are not expected to be affected as they are more influenced by topography and large-scale storm patterns. The issue of local wind pattern changes in the vicinity of Port Protection due to timber harvest will be evaluated in a separate study prior to and during any harvest proposed on Protection Head.

The proposed action would result in a continued supply of raw wood products to the Ketchikan Pulp Company mill at Ketchikan. Continued operation of the mill indirectly affects air quality in the immediate area. The likely result will be a continuation of the existing local ambient air quality over the near term with probable improvements over the long term as new technology and/or more stringent compliance practices are applied to the mill.

Cumulative Effects

The cumulative effects of the proposed action alternatives upon area air quality are not quantifiable. The desired future condition for the Forest as a whole, including the Project Area, is such that management of land for timber production, recreation, and wildlife protection will continue

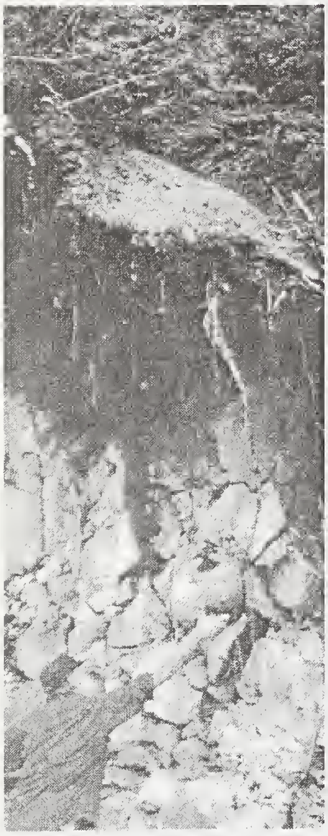
to be the dominant use of the area. The character of the area will continue as a mixture of land use activities, although it will become more heavily roaded and will experience more multiaged harvests. These actions are not expected to change the overall air quality.

Monitoring

A monitoring plan has been developed for the Tongass National Forest by the Forest Planning Team and is described in the TLMP Draft Revision (1991a). The Forest Plan contains no specific monitoring goals for air quality. State permits are required, and state air quality standards must be maintained, as directed by the state implementation plan for all work conducted on the Forest.

Project-specific monitoring that is unique to the Lab Bay Project Area, and that would not be included in regular Forest Plan or routine implementation monitoring, has not been identified for air quality. Routine implementation monitoring activity is described in Chapter 2 of this EIS.

Geology, Minerals and Karst Resources



High vulnerability karstland

Key Terms

Cave - Any naturally occurring void, cavity, recess, or system of interconnected passages which occurs beneath the surface of the earth or within a cliff or ledge and which is large enough to permit an individual to enter.

Cave Resources - Any material or substance occurring in caves such as animal life, plant life, paleontological resources, cultural resources, sediments, minerals, speleogens, and speleothems.

Doline or Sinkhole - Bowl- or funnel-shaped depressions ranging in diameter from a few to more than 3,000 feet, and from about 10 to 300 feet in depth. Sinkholes originate primarily either by solution from the surface downward or by collapse in solution cavities at depth.

Grike - Solution-widened joints, faults, and/or bedding contacts in a karst area.

Insurgence - Point at which a stream flows into the ground.

Epikarst - The upper surface of the karst, including the upper percolation zone through which surface waters enter the karst hydrologic system and in which most dissolution of the carbonate takes place.

Karst - A type of topography that develops in areas underlain by soluble rocks, primarily limestones. Dolines, collapsed channels, vertical shafts, and caves are formed when the subsurface layer dissolves. Areas on which karst has developed are said to display "karst topography" or are referred to as a "karst landscape".

Karstlands - The areas found atop carbonate rock within which karst has developed, and including the watersheds that contribute surface flow to karst.

Karst Landscape - An ecological unit found atop carbonate bedrock in which karst has developed, and including the recharge areas on adjacent noncarbonate substrate. A few of the characteristics of this ecological unit include: mature, well-developed spruce and hemlock forests; increased productivity for plant and animal communities; extremely productive aquatic communities; well-developed subsurface drainage; and underlying unique cave resources.

Resurgence - Point at which an underground stream reaches the surface and begins flowing above ground.

Runnels - Solution channels carved by water into bedrock, either on flat or inclined surfaces.

Skarn - A term generally reserved for rocks composed mostly of lime-bearing silicates, derived from nearly pure limestones into which large amounts of silicon, aluminum, iron, and magnesium have been introduced.

Speleogen - Relief features on the walls, ceiling and floor of any cave or lava tube which are part of the surrounding bedrock.

Speleothem - Any natural mineral formation or deposit occurring in a cave or lava tube, including but not limited to any stalactite, stalagmite, cave flower, flowstone, concretion, or formation of clay or mud.

Affected Environment

Geologic Setting

The geologic resources of the Lab Bay Project Area include economic minerals and the unique karst resources developed on and within soluble rocks in the area. Mining claims for both architectural marble and precious metal extraction have been or are active. The karst resources on Prince of Wales Island only have recently been recognized as containing extensive, well-developed karst systems that support entire karst ecosystems. Since little is currently known about karst resources and how they are affected by timber harvest, protection of karst resources by avoiding disturbance near identified karst features is a high priority.

Prince of Wales Island is part of the Alexander Archipelago, a group of islands that formed in warm, shallow seas during the Silurian Period about 438 to 408 million years ago. The limestone found in the Project Area originated as marine reef and lagoonal deposits that were building on volcano-cored islands straddling the equator. The islands were transported by plate tectonics to their present locations. There is no other place in the world where tropical limestones have traveled so far, been involved in such an oblique collision with a continent, and ended up emplaced in an archipelago setting at such high latitudes (Aley et al. 1993). In addition to limestone, other bedrock found on Prince of Wales Island consists of mudstone and graywacke (a dirty sandstone embedded in a muddy matrix), and marble (limestone that has been recrystallized by heat and pressure). During the Cretaceous Period (about 100 million years ago) igneous rock (granitic rock types) intruded the area (Brew et al. 1984). The heat and pressure resulting from the intrusions altered the surrounding limestone to marble, and produced zones of mineralization. Rock units have been offset by major north-south-trending faults, moving the rocks to their present location where they have been subsequently glaciated, weathered, and eroded.

Three rock types have the potential for formation of karst resources: the Heceta Limestone, the associated limestone conglomerate, and the marble that has been metamorphosed from the Heceta Limestone. These rock types underlie approximately 83,773 acres (48 percent) of unencumbered National Forest System lands in the Project Area.

Mineralized zones surrounding intrusive rocks have the potential for containing economic mineral resources. These mineralized zones are in the Calder/El Capitan Peak area, and areas in the vicinity of Salmon Bay and Exchange Cove.

Mineral Resources

The USGS conducted a mineral resource assessment of the Petersburg Quadrangle in conjunction with their Alaska Mineral Resource Assessment Project. The results of this assessment program were reported in 1984 in USGS OFR-84-572, titled Regional Geologic Summary, Metallogenesis and Mineral Resources of Southeastern Alaska (see also Britton 1992). The U.S. Bureau of Mines made modifications where additional geologic mapping information or a high density of mining claims was known (USDA Forest Service 1991a). These assessments identified two areas within the Lab Bay Project Area that are favorable for the occurrence of economic mineral deposits, and one area that is possibly favorable.

The largest site delineated by the USGS roughly spans the area between Calder and El Capitan Peak and extends both north and south of this area for approximately 6 to 7 miles. Only the north half of this area is within the Lab Bay Project Area. It is geologically favorable for the occurrence of base- or precious-metal vein deposits and skarn deposits. These are deposits derived from the limestone and may include silicon, aluminum, iron and magnesium. The known deposits within this area are concentrated in the central and southern portion of the Project Area; however, the likelihood of economically significant occurrences is limited.

The second favorable area, in the vicinity of Salmon Bay, may contain uranium, thorium and rare earth mineralization. The possibility of developing exploitable deposits of this type at the present time is limited.

An oval-shaped area, whose northwestern half overlaps the Lab Bay Project Area in the vicinity of Exchange Cove, may be favorable for the occurrence of skarn deposits. Because there are no

known deposits within the area, it is reasonable to assume that there is little potential for mining development of deposits.

Chemical grade limestone, which may have pharmaceutical value, is present over much of the Project Area, but mining claims do not record extraction for that purpose.

Mining Claims

An examination of the Bureau of Land Management (BLM) records revealed eight patented mining claim groups within the Lab Bay Project Area (Tremaine 1993). These claim groups are in the vicinity of Dry Pass near Marble Creek, near El Capitan Lake, along the west side of Red Bay, and in an area approximately mid-way between Pine Point and Point Colpoys. Each patented claim is listed in Table 3-1. The records indicate that these claims were related to marble extraction.

Table 3-1
Patented Mining Claims Within the Lab Bay Project Area

Mineral Survey No.	Location	Property Name	Acreage	Current Ownership
542	66S 77E Sect 2	Calder (Marble Ck)	40 acres	Sealaska
701	66S 77E Sect 2, 3	Calder	158 acres	Sealaska
1010	65S 78E Sect 33, 34 66S 78E Sect 3, 4, 9, 10	El Capitan	1,268 acres	Trillium
1040	64S 77E Sect 25, 26	Red Bay	113 acres	Ketchikan Pulp
1042	64S 78E Sect 9, 16	Pine Pt./ California Point	38 acres	Ketchikan Pulp
1050	66S 77E Sect 2	Calder	20 acres	Sealaska
1051	66S 77E Sect 1, 2, 11, 12	Calder	354 acres	Sealaska
1059	66S 77E Sect 11	Kosciusko	38 acres	Trillium

Source: Britton 1992

Architectural marble production has occurred in the Project Area since the early part of the century; however, no known architectural marble has been produced recently from the area. The current economics of building construction, along with some hearsay evidence that the dimension stone produced from the area proved to be of poor durability, would indicate little chance for revival of this industry in the foreseeable future. Based on those assumptions it is reasonable to conclude that these patented mining claims do not represent areas that might be developed for their marble resources in the near future.

BLM records also reflect two unpatented claims that technically remain active. The first of these, known as the Big Dummy group, is located near Port Protection and includes 3 contiguous lode mining claims. In late 1992 the BLM files indicated that these claims were considered abandoned. The second and larger group consists of 50 contiguous federal placer mining claims extending about 4 miles from an area north of Calder eastward toward Dry Pass. These claims remain active.

Karst Resources

Karst is a comprehensive term that applies to the unique topography, surface and subsurface drainage systems, and subsurface landforms that develop in areas of soluble rock. Limestone and marble, types of rock comprised primarily of soluble calcium carbonate, occur at or near the ground surface throughout extensive areas on northern Prince of Wales Island (Brew et al. 1984; Gehrels and Berg 1984).

The karst and cave resources on the Tongass National Forest are a recently discovered and recognized portion of the lands within southeastern Alaska. The karst resources of the Forest have been found to be of national and international significance for a variety of reasons (Aley et al. 1993), including the intensity and diversity of features; the biological, mineralogical, cultural, and paleontological components; and recreational values.

Karst landscapes on Prince of Wales Island support ecosystems that include highly productive plant, animal, and aquatic communities. These communities interact with the karst landscape in a complex web of hydrological, chemical, and biological reactions. The study of karst landscape and interactions on the Island is in its infancy; as studies progress, our understanding of the karst landscape on Prince of Wales Island will increase.

Cave resources are protected by the Federal Cave Resources Protection Act (FCRPA) of 1988. FCRPA provides for the protection of "significant caves," defined as caves located on Federal lands and that have been evaluated and determined to have biotic, cultural, mineralogical, paleontological, geologic, hydrologic, and/or other resources that have important values for scientific, educational or recreational purposes. The term 'cave' "...shall include any natural pit, sinkhole, or other feature which is an extension of the surface" (FCRPA 1988). For the purposes of FCRPA, significant caves are designated according to procedures and criteria in 36 CFR Part 290 regulations.

Through section 4(c)(1) of the FCRPA, Congress made clear that caves should be managed through an agency's land and resource management planning process. Since 1988, the Ketchikan Area has supported an active program of cooperative inventory, exploration, mapping, and evaluation of the caves and their associated resources. Recently, attention has been focused on the need for a clearer understanding of the functions of the karst system and its sensitivity to land management practices.

The intent of the TLMP Draft Revision (1991a) was to protect karst features from the effects of land management practices. Through the standards and guidelines, the provisions of the FCRPA have been applied to "significant karst features". These are defined as karst features with atmospheric and/or hydrologic connection between the surface and subsurface. Significant karst features can be caves as defined in the FCRPA, but also include landforms such as sinkholes, shafts, and insurgence/resurgence features.

During the summer of 1993, the Forest Service assembled an independent panel of karst specialists to assess the significance of the karst resources within the Ketchikan Area, to evaluate the effectiveness of current strategies for protecting karst resources, and to recommend appropriate changes to those strategies. The Karst Panel's primary recommendation was to develop a karst landscape vulnerability rating strategy (Aley et al. 1993). Subsequently, such a strategy was developed for the Lab Bay Project Area and implemented in 1994 as the Phase 1 and Phase 2 karst vulnerability assessments. (Harza Northwest, Inc. et al. 1994; Harza Northwest, Inc. and Ozark Underground Laboratory 1995.)

The Karst Panel also recommended a more comprehensive mitigation strategy that moved away from a karst feature protection strategy toward a more comprehensive karst systems protection approach. The Draft Karst and Cave Resource Management Forest-wide Direction and standards and guidelines (USDA Forest Service 1994a) (Draft standards and guidelines) were written with the intent that the Forest maintain a karst and cave resource management program that shall identify, evaluate, and protect karst resources, managing karst systems as ecological units to ensure protection of these resources and the cave resources within.

The Karst Vulnerability Assessment Report (Harza Northwest, Inc. et al. 1994) describes the Phase 1 vulnerability assessment of the Lab Bay Area. That report describes vulnerability map-

ping as a planning tool that provides a general picture of the quality and sensitivity of karst features that are likely to be found, or that facilitates the preliminary definition of karst vulnerability. Vulnerability mapping is not intended as the final rating of a karst area. Site-specific mapping is needed for project-specific actions, such as harvest unit and road design. The Karst Vulnerability Assessment Report, Phase 2 Site-Specific Verification Study (Harza Northwest, Inc. and Ozark Underground Laboratory 1995) confirmed an overall accuracy of 92 percent for the Phase 1 assessment. The studies include descriptions of karst features and their distribution, and delineations of areas of low, moderate, and high vulnerability classifications under different management activities.

In the discussion that follows, a summary is provided of the origin of karst features, components of karst systems and ecosystems, as well as paleontological and cultural values. These resource values were incorporated into the vulnerability rating process that delineates a Project-wide classification of karstlands. The product of that effort is the karst vulnerability assessment presented in the Phase 1 and Phase 2 studies (Harza Northwest, Inc. et al. 1994; Harza Northwest, Inc. and Ozark Underground Laboratory 1995).

Not all karst development and resources have evolved equally. Vulnerability mapping utilizes the fact that some parts of a karst landscape are subject to appreciably greater resource damage potential and groundwater contamination risk than other karstlands. These differences are a function of the extent of karst development, the continuity of solution openings, and the interdependency of associated resources that benefit from the karst groundwater system.

Figure 3-3 shows areas of high karst vulnerability in the Lab Bay Project Area. Parameters used in the assessments include geology; elevation; slope; karst features such as caves, sinkholes, insurgences and resurgences; Class I and II streams; and noncarbonate watersheds draining to karst areas. (See Karst Areas of High Value later in this section). Areas of high vulnerability are those areas that have the highest resource value and that are most sensitive to adverse impacts from management activities.

Protection measures described in the Draft Karst and Cave Resource Management Forest-wide Direction and standards and guidelines (USDA Forest Service 1994a), were applied on a case by case basis to karst features identified in proposed logging units and road locations in the Lab Bay Study Area. These measures are consistent with the recommendations for karst protection incorporated in the recently published 1996 TLMP Draft Revision.

Origin of Karst Features

Karst features on Prince of Wales Island have developed as a result of solution of carbonate bedrock. This process involves a chemical reaction between calcium carbonate ($CaCO_3$) in the rocks and acidic ground water, resulting in dissolution of the rocks. As dissolution progresses, cavities enlarge, and eventually large-scale karst features develop. On Prince of Wales Island, the following factors influence the characteristics of the karst landscape:

- Presence of carbonate bedrock (Heceta limestone formation, limestone conglomerate, marble formation).
- Purity of carbonates. Karst development requires rocks to be greater than 60 percent calcium carbonate; purer carbonates exhibit more extensive karst and cave development. Testing of limestone and marble samples from the Project Area and surrounding areas showed average $CaCO_3$ content of 97.65 percent (US Bureau of Mines 1992). This remarkable purity leads to well-developed karst systems.
- Thickness, structural integrity, and jointing of carbonates. In order for large, deep karst systems to develop, the rock mass must be strong enough to support open cavities and have enough vertical relief to form deep systems. Solution features will form along joint sets, bedding planes, faults, and formation contacts. Grikes will be common along primary joint sets, and solution channels and cliffs are more likely formed along formation contacts or faults. Caves and major sinkholes usually form at intersections of faults or prominent joint sets. As these features develop they tend to grow in the direction of fault and joint trends, although that is not always the case.

Schematic of low vulnerability karstland

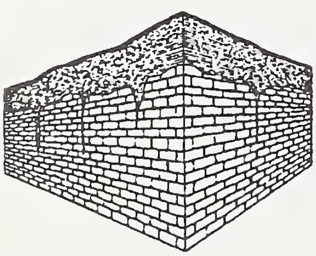
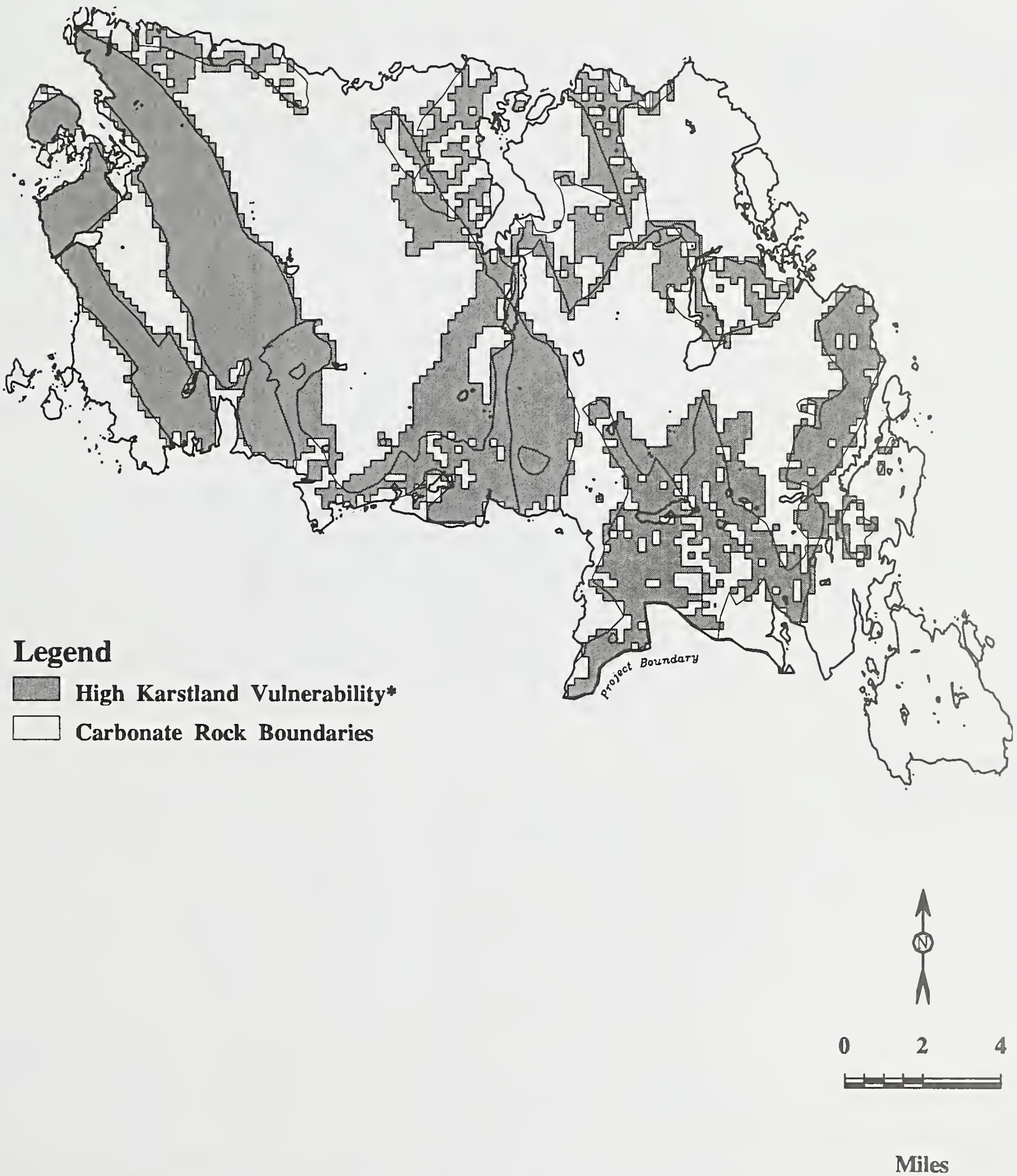


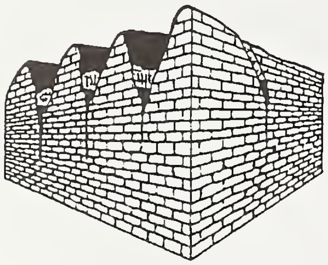
Figure 3-3
Areas of Carbonate Bedrock and Extent of High Karstland Vulnerability in the Lab Bay Project Area



Source: Phase 2 Karst Assessment; USDA Forest Service, Tongass National Forest GIS

"Karstlands" are the areas found atop carbonate rock within which karst has developed, and include the watersheds that contribute surface flow to karst. The shaded areas outside of the carbonate rock boundaries delineate watersheds that contribute surface waters directly to a karst area determined to have high vulnerability. See also Karst Areas of High Value, later in this section.

Acidic surface waters. High annual rainfall provides ample water for dissolving limestone; the rainwater is acidified by draining through organic soil horizons and muskegs. Waters flowing from peat muskegs have a pH of 3.5-5.0 (Aley et al. 1993), providing even stronger acids to dissolve the $CaCO_3$. The net effect of high annual rainfall and acidic waters is that solution of soluble bedrock occurs on the order of 4 to 8 times faster than in most other American karst areas (Aley et al. 1993).



Schematic of moderate vulnerability karstland

The combination of all of these factors has led to the evolution of extensive well-developed karst features and associated ecosystems on Prince of Wales Island. Karst development has been subjected to modification by glaciers one or more times. Glaciation modified earlier karst topography, collapsing some karst features, gouging others, and covering some with glacial sediments. When the glaciers retreated, the area resembled the present day alpine karst areas with well-developed grikes and little vegetation. Vegetation slowly developed on the karst surface, with muskegs forming on relatively impermeable glacial silts and bedrock areas. Acidic waters flowing from the muskegs helped form a system of caves and vertical shafts that combined with pre-existing karst systems (Baichtal 1993). The evolution of existing features and the development of new features actively continues today.

Some of the karst systems extend well below present sea level. Sea level has fluctuated during the last several hundred thousand years and for the most part was lower than at present. Thus, during much of the time when large karst systems were forming, freshwater movement could extend to greater depths than is presently possible. This led to the formation of breathing caves, whose outlets are submerged below sea level. Several breathing caves have been found within the Project Area.

The evolution of karst features depends on the stability of the environment that allows the system to form. For example, the formation of grikes and caves may take place simultaneously along the same fault or joint system; these features may eventually join and form extremely deep grikes leading into cave systems. Environmental changes induced by human intervention may accelerate or decelerate the solution process. Surface management practices that cause changes in surface runoff patterns, removal of organic debris that acidifies the surface water, or modification of the topography by grading will result in changes in the solution process. Understanding the interrelationships between components of the surface topography, vegetation, hydrology, and karst systems will help in developing plans to minimize human-induced changes.

Components of Karst Systems

Components of karst systems in the Project Area include surface landforms; subsurface cave systems and associated cave resources as defined by the FCRPA; and surface and subsurface hydrologic regimes. Significant karst features identified during field studies on the Project Area include caves, vertical shafts, sinkholes, stream insurgences, and stream resurgences.

In karst areas, surface processes are connected to subsurface systems through the epikarst. The epikarst is extremely important in moving water, nutrients, organic matter and soils from the land surface and from the rooting zone into the subsurface where these materials can move laterally to seeps or springs or to vertical collector structures that channel them downward into cave networks (Aley et al. 1993). The epikarst is exceptionally well developed throughout the Project Area. Alpine epikarst, which generally occurs above elevation 1,800 feet, is characterized by deep shafts, crevasse-like dissolved features, pinnacle karst, and a high density of dolines. The density of sinkholes in some portions of the Project Area is estimated at 3,000 to greater than 10,000 per square mile. Epikarst in the subalpine has the same characteristics as epikarst in the alpine, except that it is vegetated.

Low-level karst forms below elevation 1,100 feet, and is generally characterized by large closed depressions, solution channels, shallow grikes, dolines, runnels, potholes, and swallow holes. The Twin Island Lake area exemplifies low-level karst on Prince of Wales Island.

Typical depth of the epikarst zone ranges from more than 100 feet in the alpine areas to less than 5 feet along the coast. Epikarst in the lower elevations (generally below 400 feet) has been

modified by glacial processes. Glacial scouring has reduced the depth of some epikarst, while deposition of glacially-derived sediments has covered some epikarst.

Drainage of the karst terrains is primarily by subsurface flow. Therefore, surface drainage features are not well developed. Surface water generally flows only short distances before it enters the subsurface through cave entrances or other karst surface landforms. Surface streams that flow into the subsurface at karst features are insurgent streams; streams that flow from karst features to the surface are resurgent streams. Insurgent and resurgent streams are common in the parts of the Project Area underlain by carbonate rocks. In the subsurface, flow occurs in cave systems and in smaller solution-enlarged pathways.

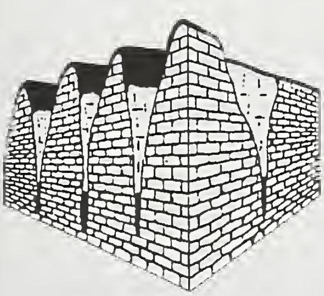
The character of karst drainage networks has important implications regarding flow characteristics of the hydrologic system, sediment transport capabilities, nutrient cycling, and the capacity and productivity of the karst ecosystem as a whole. The karst groundwater system in the Project Area is a very complex, open system characterized by convergent flow through open conduits or caves, and by divergent flow to springs (resurgences). Waters that enter the karst groundwater system in one topographic basin often discharge from springs in different basins. Waters entering the groundwater system at one point may have multiple discharge points from two or more separate springs, and at distances well over one mile from the insurgence. The karst aquifers can have extensive vertical development, exceeding 1,000 feet. Groundwater travel rates are commonly on the order of hundreds of feet per day, and may be on the order of thousands of feet per day under moderate to high flow conditions. These rates are comparable to flow rates in surface streams. The karst groundwater systems in the Project Area are very open systems with transport characteristics similar to those found in surface streams.

Surface management activities may also affect subsurface flow rates by increasing runoff. Evidence of subsurface flooding includes sumping, drowned speleothems, siltation, and debris deposition. These features have been documented at caves in the Project Area (Baichtal 1992b).

Within underground karst cave systems, a variety of speleothems are present. These unique mineral forms include helectites, soda straws, cave coral, moonmilk, and deep brown flowstones. While some of these are primarily mineral in nature, others are formed by or contain biological elements. Moonmilk, a white amorphous mass of crystals, is over two feet thick in some caves in the area, and has been found in underwater form (the first described). Moonmilk may form through bacterial action in the presence of carbonate (in Aley et al. 1993). Deep brown flowstones have been analyzed to contain a community of protozoa, fungi, and bacteria existing within humic substances.

Karst Ecosystems

Karst resources on Prince of Wales Island include not only the physical components of the karst systems, but also the biological resources that have evolved within karst areas. The solution of carbonates provides a buffering effect to water flowing through karst systems. Even acidic water becomes less acidic when draining through karst. This buffering action, along with release of nutrients dissolved from carbonates, leads to extremely productive forest and aquatic communities in areas of carbonate bedrock. Research necessary to understand karst ecosystems in the area is just beginning, with new knowledge being gained each year. The following summary provides some insights into this complex ecosystem.



Schematic of high vulnerability karstland

Vegetation

Timber that has developed on carbonate bedrock is generally larger than timber on noncarbonate rock. Figure 3-4 shows the distribution of timber Volume Class on carbonate and noncarbonate bedrock within unharvested areas on the Project Area. Nearly three-quarters of all Volume Class 7 (the largest, highest volume timber) trees are on carbonate rocks. The figure also shows that on the carbonate rock type the greatest percentage of timber in each Volume Class is represented in the high karst vulnerability classification.

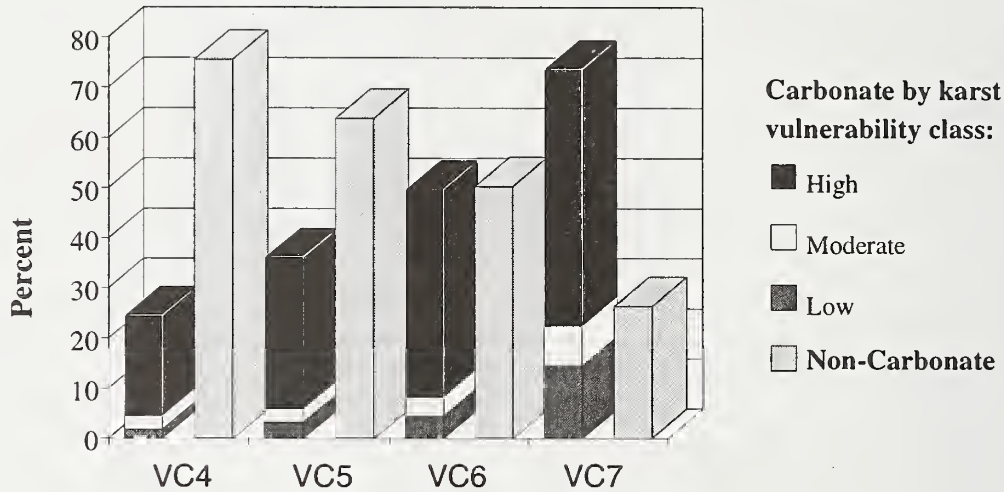
Development of these high volume, old-growth forests on carbonate bedrock can be attributed primarily to the excellent drainage characteristics of the karst, the nutrient-rich soils, and, sec-

ondarily, to the dissected bedrock surfaces that allow tree roots to penetrate into cracks, thus limiting windthrow. Trees growing on karst generally have roots extending down into the dissolved cracks in the bedrock. These roots pump water and nutrients back up into the forest canopy. Much of the site productivity is tied up in the forest canopy in this nutrient cycle.

These forests provide a well-structured, multilayered canopy that is important for wildlife winter-range habitat, and they provide a variety of niches, forbs, and shrubs that are valuable for maintaining a diverse ecosystem. The large trees produced on carbonate areas provide a valuable timber resource.

Figure 3-4

Distribution of Timber Volume Classes on Carbonate and Noncarbonate Rock Types on Unharvested Project Area Land

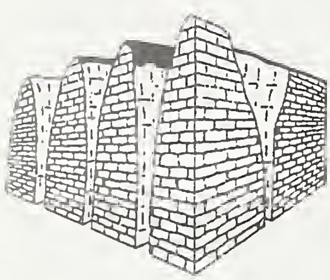


	VC4	VC5	VC6	VC7
Carbonate	25%	36%	50%	74%
Non-Carbonate	75%	64%	50%	26%

Source: GIS query, USDA Forest Service, TNF

Wildlife

In addition to the habitat provided by forests developed on carbonates, cave systems themselves provide habitat for a variety of wildlife species. Many wildlife species find the surface karst features and the stable thermal environment, as well as shelter provided within caves, to be valuable habitat.



Schematic of extremely high vulnerability karstland

Caves have been used as natal den sites for otters, and as resting and denning sites for deer, bear, wolves, and small furbearers. Deer are known to rest around cave entrances both in summer, when the air coming from the caves is cooler, and in winter, when the cave entrance is warmer than elsewhere.

Three species of bat have been reported from caves near or in the Project Area. These are *Lasionycteris noctivaganus, Myotis lucifuga,* and *M. californica. M. californica* was the first reported hibernating bat in Southeast Alaska (Baichtal and Cook 1993). The use of caves by bats in a region so far north is a recent discovery and is of great value in understanding the extremes to which bats can adapt. The stable thermal environment within the caves provides roosting habitat in winter. Bats select cave sites because they fulfill very specific requirements, involving cave structure, air circulation patterns, temperature profiles, and location relative to

feeding sites. Preliminary surveys show some bat usage of most of the caves inventoried. Bats can be found within a few caves once temperatures drop below freezing. Roost sites are beyond where freezing air temperatures penetrate from the cave entrance.

Cave systems provide habitat for many invertebrate organisms. Preliminary studies conducted during July 1992 have identified 77 species collected in several caves. Of these, 7 species show signs of cave adaptation, i.e., loss of pigment, eyes, or appendage adaptation. Taxonomic identification of these species must be done before further biological correlations or associations can be made. One amphipod has been identified as *Crangonyx obliquus-richmondensis*, the first ever record of this amphipod's occurrence in a cave in all of western North America and Alaska.

Fisheries

Water exiting from karst systems provides very productive aquatic ecosystems. The high, buffered pH, increased nutrients, and stable, cool temperatures of the water provides excellent conditions for aquatic vegetation, invertebrate, fish and amphibian populations. Preliminary studies suggest that the aquatic habitats associated with the karst landscape may be 8 to 10 times more productive than adjacent nonkarst dominated aquatic habitats. The karst dominated habitats support a higher biodiversity than the noncarbonate based systems, have higher growth rates for smolts and resident fish, reflect less variable water temperatures and flow regimes, and contain unique habitat affecting species distribution, abundance, and adaptations (Swanson 1993). In addition, karst streams have a much greater and more diverse aquatic insect population, both within caves and in streams, and in a likely testament to nutrient availability, moss and algae growth appears to be greater within carbonate dominated streams. Cave systems also may provide water storage capacity, moderating both peak flow events and summer low flows. Evidence has been found in caves of holding, spawning, and rearing by both resident and anadromous fish. Caves provide both shade and cover from predation. Conversely, the lack of developed surface streams in karst areas may limit the habitat available for fish populations. Insurgent/resurgent stream systems also may limit migration of both resident and anadromous populations.

Paleontological and Cultural Values

Abundant evidence demonstrates that caves on Prince of Wales Island have been used by animals and humans for thousands of years. Remains of otter dens dating to 5,700 years before present (B.P.), and marmot dating to over 45,000 B.P. have been discovered (Baichtal 1993). The remains of 15 brown bears and five black bears have been found in caves on Prince of Wales Island to date. The brown bears date from about 35,000 to 7,205 B.P., the black bears from 11,714 B.P. to present. Between 11,500 and 7,000 B.P. the two breeds were co-habitating. Until these discoveries, the coast of Alaska was thought to have been covered with ice during the Pleistocence. The discovery of the bear remains in caves in the Project Area enhances speculation that coastal regions once thought to be uninhabited during lulls in the Ice Age could have been occupied by humans; conditions that were suitable for the survival of large mammals may have been suitable for humans. Natives were exploring cave systems over 3,400 B.P. Continued research and exploration of caves in the Project Area likely will provide additional clues regarding the paleontological and cultural history of the area.

Recreational Values

Cave systems also provide recreational opportunities. The Ketchikan Area is working on a Cave Resource Management Strategy to help protect fragile areas and provide safe recreational opportunities. Following further exploration and inventory, some systems will be open to controlled public access (as El Cap cave currently is), and some likely will be closed to protect fragile cave resources or because of extreme safety hazards.

Karst Areas of High Value

Some portions of the Project Area are considered to have karst areas of high value because of the unique nature of the karst features there and/or because the effects of surface management activities are expected to significantly alter the resource. A total of 73,182 acres throughout the Project Area are rated as high karst vulnerability areas (Harza Northwest, Inc. and Ozark Under-

ground Laboratory 1995). Areas of high vulnerability are those areas that have the highest resource value and that are most sensitive to adverse impacts from management activities.

The following attributes characterize high-vulnerability karstlands:

- Epikarst is well developed, deeper than 8 feet, and provides direct surface to subsurface hydrologic connections. Solutional karst features are numerous, and caves may be present.
- Areas with well developed epikarst have more closely spaced, near-surface openings to which sediments can be flushed than is the case with shallow epikarst. As a result, sediment transport potential is typically much greater in areas underlain by deep and well developed karst.
- Soils tend to be very shallow (less than 10 inches), consisting of a thin, discontinuous organic duff layer. These soils belong to the McGilvery soil series and soils similar to McGilvery series. Soils that are disturbed or dried as a result of timber harvest or windthrow will likely be displaced to a depth where they are unavailable to young conifers.
- High vulnerability karstlands may contain slopes that are greater than 70 percent.
- The karst system may contribute waters to Class I or Class II streams, or to domestic watersheds.
- They lie within a watershed that contributes surface waters to a karst area determined to have a high vulnerability.

These attributes reflect the sensitivity of high karst vulnerability areas to effects from surface disturbances. For example, sediment on karst need only to move laterally for a few feet before it is directly transported downward into conduit portions of the karst groundwater system. Once sediment is in the conduits there are no effective natural processes for trapping and retaining it within the system. As a result, the sediment is delivered to a receiving spring or stream. Furthermore, the direction of flow through karst systems often cannot be predicted from surface topography or geologic mapping; water that enters the karst groundwater system at one point may have multiple discharge points from two or more separate springs.

The Twin Island Lake Area, which contains numerous caves, sinkholes, and closed depressions, is characteristic of low-elevation karst and is considered to be of high value because of major resurgence caves and the high density of karst features.

The northwestern corner of Prince of Wales Island displays rounded limestone hills separated by depressions, characteristic of cone/cockpit karst. This type of landform is rare outside of subtropical environments.

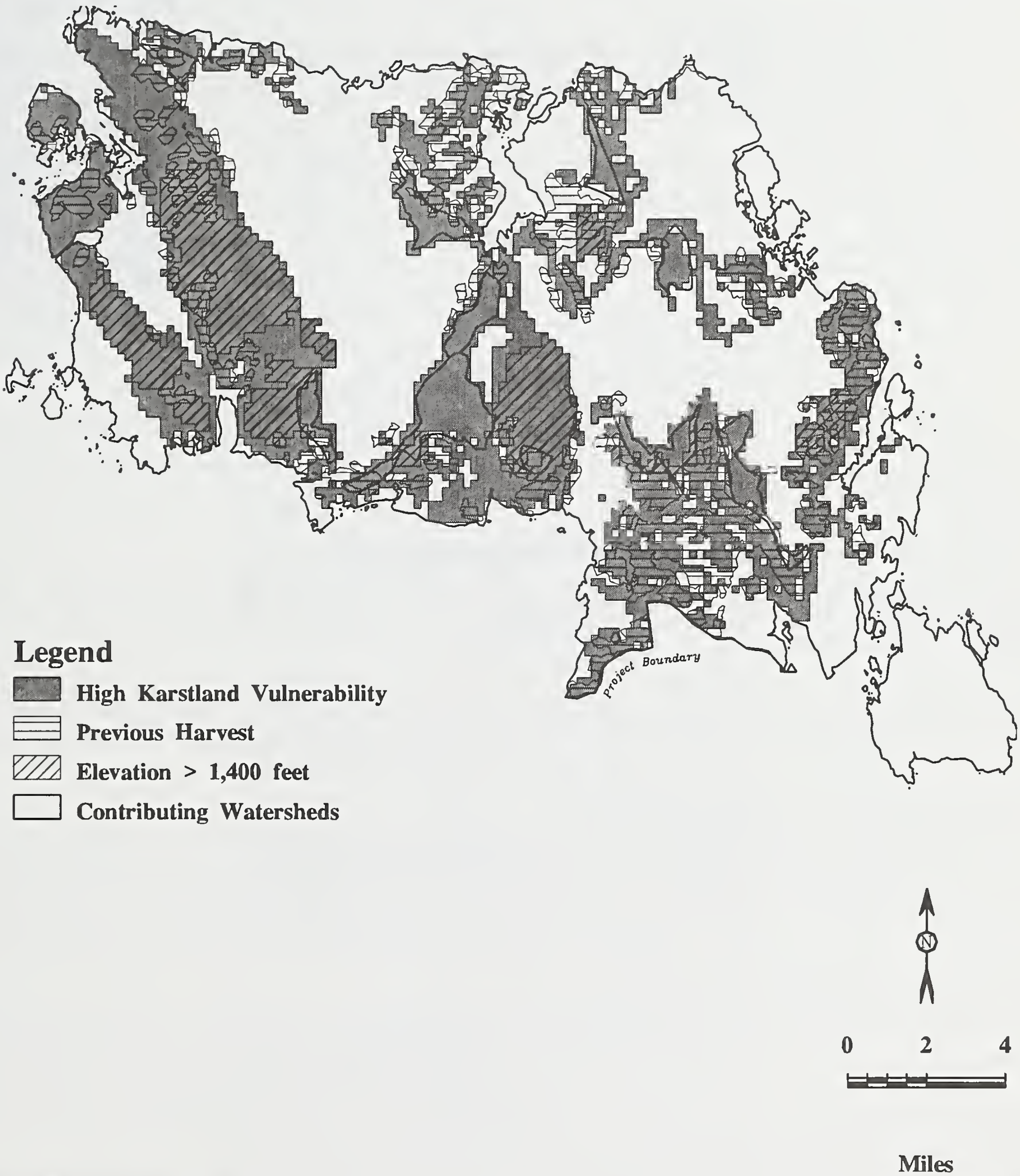
Alpine and subalpine karst areas are remarkable for the high density of surface karst landforms, potential insurgence caves, and the potential for deep karst systems that connect with lower elevation karst. These areas are also sensitive to disturbance because slopes are steep and have little soil cover.

Figure 3-5 displays all areas of high karstland vulnerability in the Project Area including watersheds that contribute surface flow to karst areas. This map also distinguishes elevations of high vulnerability karst underlain by carbonate rock, and previously harvested areas on all high karstland vulnerability areas.

Table 3-2 displays the numbers of acres portrayed in Figure 3-5. Approximately 17,380 acres of timber have been harvested on high karst vulnerability areas. Forest regeneration is generally slower on high vulnerability areas that have well-developed epikarst with thin soils or steep slopes (Aley et al. 1993) (see Karst Resources discussion below).

Table 3-2 also shows that 17,970 acres of high karst vulnerability are at elevations greater than 1,400 feet. Above this elevation, karst is typically very well developed. The 1,400 foot elevation delineates the average lower limits of the sub-alpine zone and the upper limit of most commercial forestland. Additionally, above 1,400 feet, regeneration of harvested lands on karst is slow because soils are generally thin and slopes are typically steep (Aley et al. 1993).

Figure 3-5
Lab Bay Project Area: High Karstland Vulnerability with Areas of Previous Harvest and Elevation Greater Than 1,400 Feet



"Karstlands" are the areas found atop carbonate rock within which karst has developed, and include the watersheds that contribute surface flow to karst.

The map depicts previously harvested areas that are on high vulnerability karstlands, and elevations greater than 1,400 feet that are on high vulnerability karst.

Source: Phase 2 Karst Assement GIS query, USDA Forest Service, TNF

The inclusion of contributing watersheds in the high vulnerability rating is due to the potential for adverse effects from surface flow into karst systems. The vulnerability rating of contributing watersheds can be modified (downgraded) where on-site investigation demonstrates that surface flow from the watershed does not connect to any insurgence in the karst areas downstream.

Table 3-2

Acres of High Karstland Vulnerability, with Acres of Previous Harvest and Elevation Greater Than 1,400 Feet, in the Project Area[1]

	High Vulnerability Karstlands	Previous Harvest[2]	Elevation Greater Than 1,400 Feet[3]
Acres on Karst	64,096	17,380	17,970
Acres on Contributing Watersheds	8,992	1,787	4,304
Total Acres	**73,088**	**19,167**	**22,274**

Source: GIS query, USDA Forest Service, TNF

1 Includes all ownerships within the Lab Bay Project Area.

2 Acres of previous harvest on all high karstland vulnerability areas.

3 Acres of elevation greater than 1,400 feet on all high karstland vulnerability areas.

Effects of Alternatives

Direct and Indirect Effects

This section describes the potential direct and indirect effects on karst resources from implementation of the action alternatives.

Minerals

The Lab Bay Project Area offers little opportunity for significant mineral development in the near future; however, any mineral development that might occur could be enhanced by the roads and other infrastructure that would accompany timber harvest.

Karst Resources

Karstlands impose land management liabilities not encountered in nonkarst areas because karst's three-dimensional landform functions differently than other landforms. Some parts of the karst landscape are more vulnerable than others to the effects of surface activities and groundwater contamination. The differences in vulnerability may be a function of the extent of karst development, the openness of the karst systems, and the sensitivity of other resources that benefit from karst groundwater systems.

Surface management activities such as timber harvest and road construction are expected to have lasting or potentially irreversible effects on vulnerable karst resources, and they may adversely affect regeneration capabilities on these lands. High vulnerability karstlands are particularly sensitive to land management activities. Timber management and related activities are recommended to be excluded from these lands, except that small areas may be crossed by roads to access harvest areas (USDA Forest Service 1994a).

Any surface management activity in karst terrain is likely to affect the components of a karst system. Surface landforms and surface water hydrology would most obviously be affected; however, the direct link between surface water hydrology and subsurface drainage implies that cave ecosystems also would be affected.

High vulnerability karstland

Unit-Specific Effects

Table 3-3 displays harvest units rated as high vulnerability in each action alternative. The table lists the parameters that delineate these units as high vulnerability. The number of acres classified as high vulnerability in each harvest unit is also displayed.

Unmitigated harvest activities can have adverse effects on the portions of karst systems at the surface, as well as on the subsurface and biological components of karst ecosystems. The extent to which the karst system is affected by surface management activities will depend on factors such as the presence of well-developed significant karst features, the character of the soil cover, and slope gradient. Harvesting these units may have lasting or potentially irreversible effects and likely would not meet Draft standards and guidelines (USDA Forest Service 1994a).

Table 3-3 shows that 31 of 33 harvest units located on high vulnerability karst have significant karst features, which may include caves, sinkholes, vertical shafts, or insurgences and resurgences. These well developed features have atmospheric or hydrologic connections between the surface and the subsurface, and are likely to affect large, underground karst systems. Adverse effects on karst resources are likely to be exacerbated where elevations are greater than 1,400 feet or where slopes are steep. Above this elevation, karst features typically are extremely well developed and the soils are predominately composed of a thin organic mat. Table 3-3 shows that 12 of 14 harvest units above elevation 1,400 feet also have steep slopes.

The effects on harvest units with significant karst features may include:

- Disruption or destruction of vegetation and the environment around cave entrances;
- Disruption of sensitive habitat within caves by blasting during road construction (some shallow cave roofs and speleothems are shattered by road blasting shock or load from heavy machinery);
- Filling surface karst features with road materials, wood, soil, or logging debris; and filling with sediment transported by increased runoff;
- Removal of soil from sinkhole or grike sideslopes, preventing or inhibiting revegetation (soil losses are much more severe on well developed, deep epikarst as most soil is displaced into the cavities of the epikarst zone);
- Changing karst hydrology by altering surface drainage patterns, plugging insurgence and resurgence points, and establishing new insurgence points (by channeling runoff into sinkholes); and
- Altering cave environments by introducing debris and sediment and changing water flow patterns in caves. Examples include introducing logging debris into the cave system; plugging flow paths with debris or sediment that may result in sumping (and subsequent damage of speleothems); and increasing sedimentation within caves. Alterations in a cave's microenvironment may affect not only the biological components of the cave system, but paleontological or cultural resources as well.

Harvest of the forest canopy and disruption of surface water drainage patterns alters the flow of water through subsurface karst systems. Channeling of water into karst features increases water flow rates, while plugging features with sediment or slash decreases flow rates. This could, in turn, flood or dry out passages, increase sediment loads, and disrupt precipitation and growth of speleothems and cave formations.

Removal of vegetation may also disrupt the nutrient and water cycling ability of the forest, or alter the pH, nutrient content, and volume of water entering karst systems. In turn, these effects could alter the productivity of ecosystems that are dependent upon the karst landscape.

Forest regeneration following timber harvest can be a concern on some high vulnerability karst areas. The majority of karst areas that have been harvested within the Project Area are at low to moderate elevations. Forest regeneration can be exceptional in the low and moderate vulnerability karst areas, where mineral soils or glacially derived soils overlie the karst systems or where the epikarst is relatively shallow. However, forest regeneration has been occurring at a

slower rate or a less than desirable rate on high vulnerability sites at higher elevations, where soils are thinner, slopes are steeper, and/or where karst development is more intense (Aley et al. 1993).

Table 3-3
Parameters That Delineate the High Vulnerability Classification for 32 Proposed Harvest Units on Karst, by Alternative

VCU-Unit	Alternative 2	3	4	5	6	Elevation > 1,400 Ft	Steep Slopes	Significant Karst Features[1]	Class I or II Streams	Domestic Watershed[2]	Acres
527-206	X			X			X	X		X	69.7
527-224	X		X	X			X	X			35.6
527-226	X			X			X	X	X	X	51.7
527-227	X		X	X			X	X			6.6
527-228	X		X	X			X	X			33.6
527-229	X		X	X			X	X			25.8
528-212	X		X			X	X	X			11.8
528-213	X		X			X	X	X			13.1
529-220	X		X			X		X			35.2
529-286	X		X					X	X		38.3
531.1-205	X			X		X	X	X			68.6
531.1-208	X			X			X	X	X		38.1
531.1-213	X					X	X	X			87.9
531.1-220	X		X			X	X	X			21.0
531.1-221	X		X			X	X	X			10.4
531.1-229	X					X	X	X			47.6
531.1-230	X		X			X	X	X			76.1
532-228	X			X				X			29.1
532-229	X			X				X	X		54.2
533-252	X		X	X		X	X	X			43.1
533-254	X			X		X	X	X			10.0
533-255	X			X		X	X	X			8.8
533-256	X			X			X	X			4.0
533-257	X			X			X	X			11.2
533-258	X			X			X	X			10.4
533-259	X			X		X		X			9.9
536-211	X		X	X			X	X			16.0
536-217	X						X	X			75.8
538-223	X		X				X				25.1
539-215	X		X					X	X		28.4
539-220	X		X	X		X	X	X			28.3
539-221	X		X	X			X	X			41.5
Total	**32**	**0**	**17**	**20**	**0**	**14**	**26**	**31**	**5**	**2**	**1068**

Source: GIS query, USDA Forest Service, TNF

1 Significant karst features with atmospheric or hydrologic connection between the surface and subsurface. Significant features include caves, sinkholes, vertical shafts, insurgences and resurgences.

2 Units on karst that are within a surface watershed which contributes to a domestic water supply.

In the Project Area, soils on karst that are derived from soluble rock are generally thin and slow to develop. This is due to the purity of soluble rock, from which about 98 percent of the weathering products of the rock are carried away in solution. Soils that are disturbed or dried as a result of timber harvest on areas of deep epikarst development likely would be displaced to a depth where they are unavailable to young conifers, which can adversely affect regeneration capabilities on high vulnerability karst. These effects are exacerbated on steep slopes. Twenty seven harvest units on high vulnerability karst have steep slopes (Table 3-3).

Areas with deep and well-developed epikarst have more closely spaced near-surface openings into which sediments can be flushed than is the case in areas with only shallow epikarst. As a result, sediment transport potential is typically much greater in areas underlain by deep and well-developed epikarst. Most of the thin epikarst occurs in areas at relatively low elevations on the inner islands. These are also areas with typically less rugged relief. Much of the remaining virgin forest on karst is underlain by deep and well-developed epikarst and is characterized by steeper slopes. When timber harvest and road construction occur on well-developed epikarst with steep slopes, sediment displacement is substantially greater than on the thin epikarst and lower relief lands.

Karst areas transport sediment differently from nonkarst areas. Much of the sediment on karst moves laterally for only a few feet before it is directly transported downward into conduit portions of the karst groundwater system. Once sediment is in the conduits, there are no effective natural processes for trapping and retaining it within the system (Aley et al. 1993). As a result, the sediment is delivered to a receiving spring or stream. Furthermore, the direction of flow through karst systems often cannot be predicted from surface topography or geologic mapping; water that enters the karst groundwater system at one point may have multiple discharge points from two or more separate springs. Sedimentation into open karst groundwater systems has the potential to adversely affect aquatic resources, including fisheries, and domestic water supplies. At least 5 harvest units on high vulnerability karst are proximal to Class I or Class II streams, and 2 units are within known domestic watersheds (Table 3-3).

Table 3-4 summarizes the effects of each action alternative on vulnerable karst resources, displaying the proposed harvest in acres and as a percent of the total harvest. Also shown are the number of units, acres and miles of roads proposed on high vulnerability karst.

Alternative 1, the No Action Alternative, would result in no new effects on high karst vulnerability areas. Of the action alternatives, Alternative 2 would result in the most units (32) and the greatest area (1,068 acres) and greatest distance of roads (10.7 miles) on high vulnerability karst. Alternatives 4 and 5, which distribute units and areas similarly to each other, would each result in fewer units, area and miles of road on karst than would Alternative 2. Alternatives 3 and 6 exclude timberlands on high vulnerability karst areas from harvest. However, 0.4 and 0.1 miles of road would cross high vulnerability under Alternatives 3 and 6, respectively.

Table 3-5 displays by VCU the acres of proposed harvest on high vulnerability karst for each of the action alternatives.

Table 3-4
Proposed Harvest Units and Roads on Karstlands

Environmental Consequence	Measure	Alternatives 2	3	4	5	6
Area of Harvest Units on Karst	Acres	1,314	23	711	791	138
Percent of Total Harvest Area	Percent	29	<1	25	26	7
Harvest Units with High Vulnerability	No.	32	0	17	20	0
Area of Harvest Units with High Vulnerability	Acres	1,068	0	491	584	0
New Roads on High Vulnerability Karst*	Miles	10.7	0.4	6.8	5.5	0.1

Source: GIS query, USDA Forest Service, TNF

* Excludes contributing watersheds.

Table 3-5
Acres of Proposed Harvest on High Vulnerability Karstlands

	Proposed Harvest on High Karst Vulnerability				
VCU	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
527	223	0	102	223	0
528	25	0	25	0	0
528.1	0	0	0	0	0
529	74	0	74	0	0
530	0	0	0	0	0
531.1	350	0	108	107	0
531.3	0	0	0	0	0
532	83	0	0	83	0
533	98	0	43	98	0
534	0	0	0	0	0
534.1	0	0	0	0	0
534.2	0	0	0	0	0
534.3	0	0	0	0	0
534.4	0	0	0	0	0
535	0	0	0	0	0
536	92	0	16	16	0
537.1	0	0	0	0	0
538	25	0	25	0	0
539	98	0	98	70	0
540	0	0	0	0	0
551	0	0	0	0	0
Total Acres	**1,068**	**0**	**491**	**584**	**0**

Source: GIS Query, USDA Forest Service, TNF

Cumulative Effects

Cumulative effects are the result of changes in the environment caused by multiple management actions. This assessment of cumulative effects focuses on karstlands which are vulnerable to irreparable resource damage. The objective of this section is to describe the amount of karstland that is present on the suitable forestland base and will be harvested between now and the year 2054.

Areas underlain by carbonate rock in the Lab Bay Project Area are noted for their production of high volume stands of timber (Figure 3-4). Table 3-6 identifies the total acres of karstlands that are present on National Forest System Land within the Lab Bay Project Area by vulnerability rating. Approximately 53 percent of the National Forest System Land within the Project Area is identified as karstland. Although some areas of carbonate rock produce high volume stands of timber, not all karstlands have merchantable timber growing on them. Many areas of karstland also support nonproductive stands of timber, or are located in subalpine and alpine areas that contain few merchantable trees.

Table 3-6
Acres of Karstland by Vulnerability Rating on National Forest System Lands within the Project Area[1]

Vulnerability Rating	Acres
Low	7,203
Moderate	9,870
High	66,700
Total	**83,773**

Source: GIS query, USDA Forest Service, TNF

[1] Does not include state, private, or encumbered lands within the Project Area.

The Silviculture, Timber, and Vegetation section of this chapter identifies the suitable forestland within the Project Area as defined by the TLMP Draft Revision (1991a). Table 3-7 reflects the acres of suitable forestland within the Lab Bay Project Area. Suitable forestland occurs on a variety of rock types, although they are predominately carbonate rocks.

Table 3-7
Acres of Suitable Forestland

	Acres
Second Growth	26,531
Old Growth	47,599
Total Suitable Forestland	**74,130**

Source: GIS query, USDA Forest Service, TNF

Future harvest within the Project Area is directed toward achieving the desired future condition for each LUD as described in the TLMP Draft Revision (1991a). Most suitable forestland is scheduled to be harvested by 2054. During the period from 1995 to 2054, the existing 47,599 acres of old-growth suitable for harvest would be converted to second growth stands.

Table 3-8 identifies the acres of suitable forestland that are present on each vulnerability rating and whether the site has been previously harvested or is currently in an old-growth condition.

Detail of extremely well developed deep epikarst

Table 3-8
Low, Moderate, and High Karstland on Suitable Forestland by Vulnerability Rating

Vulnerability Rating	Previous Harvest	Suitable Forestland Old Growth Remaining	Total Suitable Forestland
Low	1,127	1,326	2,453
Moderate	4,135	2,624	6,759
High	15,361	20,438	35,799
Total	**20,623**	**24,388**	**45,011**

Source: GIS query, USDA Forest Service, TNF

Table 3-9 displays the projected cumulative acres of timber harvest on high vulnerability karstlands (on suitable forestland) in the Lab Bay Project Area. This table assumes that 1,068 acres would be harvested on high vulnerability karst between the period of 1994 and 2004. This harvest level corresponds to the acres present on high vulnerability karst in Alternative 2. Between 2004 and 2054, most suitable forest lands that are rated as high vulnerability are scheduled to be harvested.

Table 3-9
Cumulative Harvest on High Vulnerability Karstlands

Year	Cumulative Acres Harvested	Old Growth Acres Remaining	Total High Vulnerability on Suitable Forestland
1954	0	35,893	35,893
1994	15,361	20,532	35,893
2004	16,429	19,464	35,893
2054	35,893	0	35,893

Source: GIS query, USDA Forest Service, TNF

Effects of Changing Management Direction

The management of timber harvest activities with regard to karst resources has received a great deal of attention in recent years. Some of this attention is in response to the requirements of the Federal Cave Resources Protection Act (FCRPA 1988) and increased public awareness of the karst resources on the Tongass National Forest. Studies conducted recently have included an independent Karst Panel assembled to assess the significance of the karst resources on the Ketchikan Area. The Karst Panel's primary recommendation was to develop a karst landscape vulnerability rating strategy (Aley et al. 1993). Subsequently, such a strategy was developed and implemented in the Lab Bay Project Area as the Phase 1 and Phase 2 karst vulnerability assessments (Harza Northwest, Inc. et al. 1994; Harza Northwest, Inc. and Ozark Underground Laboratory 1995). The Karst Panel also recommended a more comprehensive mitigation strategy for managing timber harvest on karst ecosystems, rather than the protection of individual features. The Draft Karst and Cave Resource Management Forest-wide Direction and standards and guidelines (USDA Forest Service 1994a) were written in response to this recommendation.

At the current time, timber harvest is allowed on all ratings of karst vulnerability if the area is within the suitable timber base. If additional measures are adopted to protect karst systems in the future, reductions in the amount of timber available for harvest would occur within the Project Area. The amount of this reduction would be dependent on the level of protection implemented. Table 3-10 displays the potential effects on the suitable land base, if harvest restrictions are applied to high vulnerability karstland.

Approximately 9,000 acres of noncarbonate watersheds that drain onto high vulnerability karst areas were included in the mapped acreage of high vulnerability. Contributing watersheds are included in the high vulnerability rating because of the potential for adverse effects from surface flow into karst systems. The vulnerability rating of the contributing watersheds can be modified (downgraded) where on-site investigation demonstrates that surface flow from the watershed does not connect to any insurgence in the karst areas downstream.

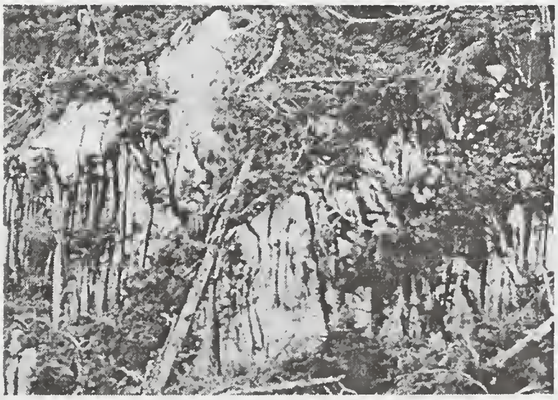
Additional field verification of high vulnerability areas during future harvest unit planning may also identify some areas that could be downgraded to moderate or low vulnerability. This downgrading would then allow timber harvesting, provided that effective mitigation measures were implemented.

Table 3-10
Potential Change in Suitable Forestland Resulting from Harvest Restrictions on High Vulnerability Karstlands

	Current Suitable Acres	Suitable Acres without High Vulnerability Karst	Percent Reduction in Suitable Acres
Previously Harvested	26,531	11,170	58 %
Remaining Old Growth	47,599	27,161	43 %
Total Suitable Forestland	**74,130**	**38,331**	**48 %**

Source: GIS query, USDA Forest Service, TNF

The use of conservation biology strategies and landscape management techniques as a means of achieving multiple resource management objectives has been the focus of various studies (Suring et al. 1993a; FEMAT 1993). (Refer to the Wildlife, Old Growth, and Biodiversity section for additional discussion of conservation biology strategies.) These types of conservation strategies serve to protect multiple resources. For example, the Lab Bay Project-defined Contiguous Old Growth Areas would not only assist in maintaining population viability at the province level, but would also protect a portion of the high vulnerability karstlands. Likewise, the protection of high vulnerability karstlands would assist in providing for the maintenance of population viability at the province level.



Epikarst with runnels exceeding eight feet deep

Mitigation

Mineral Resources

Based on indications of limited interest in future mineral development as well as preliminary industry response regarding proposed timber harvest and road construction, no mitigation measures are recommended in relation to possible mineral development in the area. All known mineral improvements, such as mine claim markers, would be protected, and reasonable access would be provided for mining claims.

Karst Resources

The importance of cave resources has been recognized by the Forest Service in the study area since 1988. This recognition, and the enactment of the Federal Cave Resources Protection Act in 1988, led to cave inventory work and ultimately to the development of standards and guidelines (TLMP Draft Revision 1991a, standards and guidelines). Aley et al. (1993) identified cases where these standards and guidelines have provided adequate protection for individual cave features and cases where they have not.

On Prince of Wales Island, review of past harvest areas under standards and guidelines (TLMP Draft Revision 1991a) revealed cases where adequate cave protection has occurred. These cases typically have both of the following characteristics:

1. The block of forest in which the cave entrance is located has not been logged or roaded and the cave is far enough from clearcut areas that accelerated windthrow of trees does not occur close enough to the cave entrance to alter entrance microclimate.

2. None of the area which contributes water to the cave is affected by logging or road construction.

Cases where implementation of standards and guidelines (TLMP Draft Revision 1991a) have not provided adequate protection for cave features typically have some or all of the following characteristics:

1. The area around the cave entrance has been logged and no buffer zone, or only a narrow buffer zone, of uncut trees was retained around the entrance. Windthrow of trees, when they are left in small, isolated patches, is excessive and appears to almost always occur.

2. Roads, quarries, or clearcuts were located in areas which contribute waters to the cave.

3. Caves were not discovered early enough to modify the cutting area and/or road construction.

Aley et al. (1993) identified short-comings of past cave resource protection in the study area, including:

1. The level of effort expended in reconnaissance work to locate and assess caves has been too low to identify all significant features.

2. Insufficient time between reconnaissance work and the start of road construction or timber harvest activities to develop feasible mitigation opportunities.

3. The full extent of the adverse impacts of roads and quarries on cave resources was not thoroughly recognized.

4. Typical cave resource protection in the study area has focused almost exclusively on individual large caves and not on the complete karst ecosystem.

From this review, the Karst Panel (Aley et al. 1993) recommended a more comprehensive mitigation strategy that moved away from a karst feature protection strategy toward a more comprehensive karst systems protection approach. The Draft Karst and Cave Resource Management Forest-wide Direction and Standard and Guidelines (USDA Forest Service 1994a) were written with the intent that the Forest maintain a karst and cave resource management program that shall identify, evaluate, and protect karst resources, managing karst systems as ecological units to ensure protection of these resources and the cave resources within.

The Draft standards and guidelines (USDA Forest Service 1994a) require that timber harvest and road construction activities in the vicinity of caves or significant karst features be designed to ensure protection of cave resources. Methods described there include retention of vegetation in the vicinity of features, felling trees away from features, no yarding across features, avoiding alteration of drainage into features, avoiding piling slash or debris in features, avoiding filling or channeling of road drainage into features, avoiding road construction over features, ensuring that blasting does not disturb species using cave systems, and restricting harvest on high vulnerability karstlands.

Protection of karst resources proposed for Lab Bay Project is provided in Table 2-5, and includes one or more of the following:

- Modification of unit boundaries or road locations to exclude karst features;
- Implementation of buffer zones and special management practices within units or along roads; or
- Removal of the unit or road from consideration for harvest.

The unit-by-unit survey conducted during the 1992, 1994, and 1995 field seasons provided opportunity to modify unit boundaries with potentially significant karst features. The use of buffers and specific management practices has been proposed on units of moderate vulnerability where karst features may not attain the official significance level but where protection is necessary until more investigation is undertaken. Specific mitigation measures for units and roads with karst features are noted on unit and road cards (Appendices F and H). In addition, road access was prevented in several areas where crossing significant karst features would have been unavoidable.

Implementation of mitigation on the 32 harvest units listed in Table 3-3 is expected to have a range of effects on karst resources and on the levels of harvest in those units. For 12 harvest units, mitigation would effectively prohibit harvest activities; for 20 units, harvest would likely result in irreversible effects on karst resources because adverse effects cannot be mitigated; and in 4 harvest units mitigation is likely to be effective and feasible from a logging systems perspective.

Effective mitigation is expected to substantially reduce or eliminate all harvest in 12 units due to the high density of significant karst features. The maintenance of 100-foot minimum windfirm buffers around caves and other significant features would effectively eliminate harvest activities due to the density of these features. Harvest units with a high density of significant karst features include: 527-227, 527-228, 531.1-213, 531.1-229, 533-252, 533-254, 533-255, 533-256, 533-257, 533-258, 533-259, and 536-217.

Extremely high vulnerability karstland

Twenty-one harvest units are expected to receive resource damage despite implementation of mitigation. While adequate buffers may be maintained, these units are located on steep slopes and have significant karst features and/or thin soils, and/or they are at elevations where regeneration is likely to be impaired. These 21 units include: 527-206, 527-224, 527-226, 527-229, 528-212, 528-213, 529-220, 531.1-205, 531.1-208, 531.1-213, 531.1-220, 531.1-221, 531.1-229, 531.1-230, 533-252, 533-254, 533-255, 536-211, 538-223, 539-220, and 539-221. (Units 531.1-213, 531.1-229, 533-252, 533-254, and 533-255 are included in both the first and second groups.)

Implementation of mitigation on 4 harvest units is expected to be effective because these units are on gentle slopes at lower elevations with deeper soils, and significant karst features are broadly dispersed. These 4 harvest units are: 529-286, 532-228, 532-229, and 539-215.

Based on experience with past harvest in karst areas, the Ketchikan Area has found that avoidance of karst features is the best way to protect them. Alternatives 3 and 6 exclude from harvest timberlands on high vulnerability karstlands, whereas Alternatives 2, 4, and 5 do not. Under Alternative 2, 1,068 acres on high vulnerability karstlands would be harvested; Alternative 4 would harvest 491 acres; and 584 acres would be harvested under Alternative 5. If these units are harvested, Draft standards and guidelines (USDA Forest Service 1994a) may not be met.

Additional karst resource mitigation can also be provided during final harvest unit layout. The Ketchikan Area karst resource specialist should review unit layout during final review on all units located on high vulnerability karstlands.

Cave resources offer recreational opportunities in the Project Area. A Cave Resource Management Strategy has been developed (USDA Forest Service 1994a) to help protect fragile areas and provide safe recreational opportunities. Following further exploration and inventory, some systems will be open to controlled public access, and some likely will be closed to protect fragile cave resources.

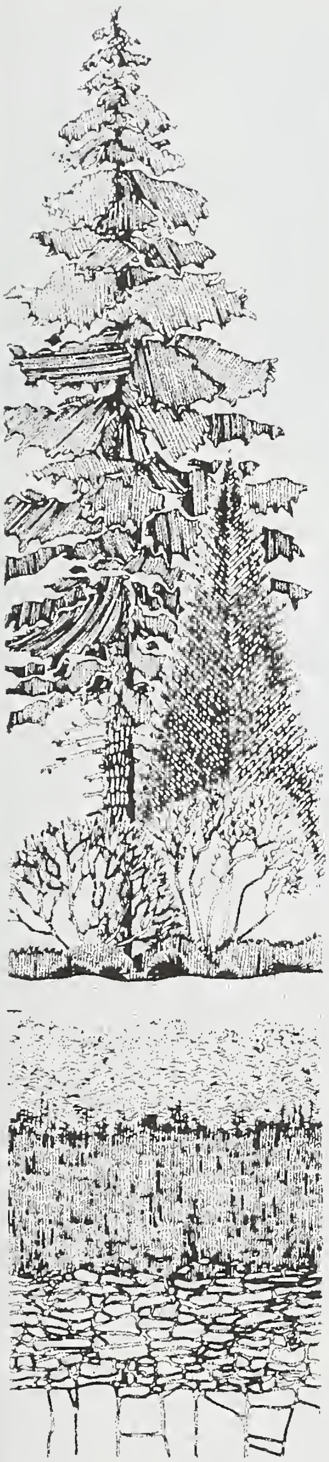
Monitoring

The Forest Plan recognizes three distinct types of monitoring: implementation, effectiveness, and validation. Implementation monitoring determines if projects and activities comply with Forest Plan standards and guidelines. Effectiveness monitoring determines whether the standards and guidelines achieve the desired result. Validation monitoring determines whether the assumptions in the Forest Plan regarding the relationship between management actions and their effects are correct, or if there is a better way to depict these relationships.

A monitoring plan has been developed for the Tongass National Forest by the Forest Planning Team and is described in the TLMP Draft Revision (1991a). The Lab Bay Project Area will contribute towards meeting overall Forest Plan monitoring goals through the selection of proposed harvest units/roads for monitoring. Recommendations for monitoring geological resources for the Lab Bay Project Area have been documented in the Mineral (Britton 1992) and Karst (Bielefeld 1993) Resource Reports and the project planning record.

Project-specific monitoring that is unique to the Lab Bay Project Area, and that would not be included in regular Forest Plan or routine implementation monitoring, has been identified for several resources. Karst resources are included in project-specific monitoring for the Lab Bay Project Area. This monitoring activity is described in Chapter 2.

Soils



Key Terms

Best Management Practices (BMP's) - Land management methods, measures or practices intended to minimize or reduce water pollution. Usually BMP's are applied as a system of practices rather than a single practice. BMP's are selected on the basis of site-specific conditions that reflect natural background conditions and political, social, economic, and technical feasibility.

Debris Avalanche - The sudden movement downslope of the soil mantle; occurs on steep slopes and is often triggered by the complete saturation of the soil from prolonged heavy rains.

Debris Torrent - Landslides that occur as a result of debris; avalanche materials which either dam a channel temporarily or accumulate behind temporary obstructions such as logs and forest debris. Debris torrents are usually confined within the stream channel until they reach the valley floor, where the debris spreads out, inundating vegetation and forming a broad surface deposit.

Lacustrine Sediments - Fine sediment (generally silt and clay) deposited in an ancient lake bed.

Mass Movement/wasting - General term for a variety of processes by which large masses of earth material are moved by gravity, either slowly or quickly, downslope.

Mass Movement Index (MMI) - Rating used to group soil map units that have similar properties with respect to the stability of natural slopes.

Riparian Management Area (RMA) - The area including water, land and plants that is within at least 100 slope feet from each side of perennial streams, lakes and other bodies of fresh water, as defined in the Stream and Lake Protection LUD.

Sediment - Solid materials, in suspension or transported by water, gravity, ice, or air.

Soil Mapping Unit (SMU) -An area of relatively uniform soil and geomorphic characteristics.

Soil Productivity - Capacity of a soil to produce plant growth, due to the soil's inherent chemical, physical, and biological properties.

Till - Gravel, boulders, sand, and finer materials transported and deposited by a glacier.

V-Notch - A shallow to deeply cut stream drainage, generally in steep, mountainous terrain; would look like a "V" from a frontal view.

Wetlands - Areas that are inundated by surface or groundwater with a frequency sufficient to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include muskegs, marshes, bogs, wet meadows, river overflows, mud flats, and natural ponds.

Affected Environment

The development of soils in Southeast Alaska is influenced by high levels of rainfall, a short growing season, cool summer temperatures, and cool soil temperatures. Under these conditions, soils are often saturated and organic matter decomposes slowly.

In the Project Area, soils are found on a variety of landforms shaped by past glaciation, which produced U-shaped valleys and mountains extending 2,000 to 3,000 feet above sea level. Depos-

its of glacial till occur in the valley bottoms and often extend up to about 1,500 feet elevation on the sideslopes. Tectonic uplift and fluvial erosion and deposition continue to modify the landscape since retreat of the glaciers, about 10,000 years ago.

Soils in the Project Area have developed from a variety of inorganic (mineral) and organic (vegetative) sources. Mineral soils developed from glacial deposits, stream and uplifted marine sediments, metamorphic and igneous rock, and colluvium. Organic soils developed from deposits of decomposed plant materials that generally collect in poorly drained areas associated with low relief and/or impermeable subsurface layers. Deep, poorly decomposed, acidic organic soils that support open areas of herbaceous vegetation are referred to as muskegs. In the geologic and climatic setting found in the Project Area, thin organic soils may also develop in well-drained areas and support western hemlock plant associations. Soils on karst that are derived from soluble rock are generally thin and slow to develop. Soils that are disturbed or dried as a result of timber harvest could be displaced to a depth where they are unavailable to young conifers, which can adversely affect regeneration capabilities on high vulnerability karst (Aley et al. 1993, p.54).

Soil Productivity

The characteristics and conditions of the soil affects the productivity of many other forest resources. Tree growth, wildlife and fish habitat and recreation opportunities are influenced by soil quality. Soil drainage and soil depth are responsible for the greatest difference in forest productivity in Southeast Alaska. In general, soils with poor drainage or shallow depth (< 10 inches) are lower in productivity than deeper, well-drained soils. The productivity of poorly drained organic soils is generally much lower than that of mineral soils.

Some of the most productive soils in the Project Area are those derived from Heceta Limestone. Due to the fractured and karsted nature of the limestone, these soils are well drained. Areas with soils overlaying limestone include the sideslopes of the valleys between Calder Bay and Point Baker (Calder Creek valley and the Perue Peak area, Mount Calder, Flicker Ridge, the slopes surrounding Port Protection and Labouchere Bay) and the area from Neck Lake north to Exchange Cove, west to El Capitan Peak and north to Red Lake.

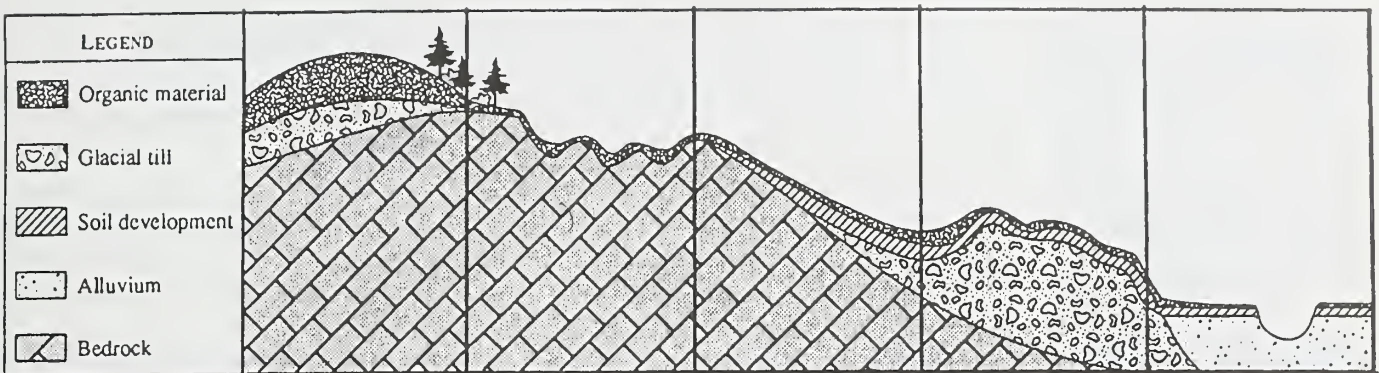
McGilvery soils are very shallow, organic soils. The TLMP Draft Revision (1991a) proposes soil map units (SMU's) with more than 40 percent McGilvery soils as unsuitable for timber harvest. These soils are somewhat fragile because soil disturbance during yarding often scrapes the entire soil mantle off the bedrock. Although no SMU's with greater than 40 percent McGilvery soils are mapped within the Project Area, two areas (38 acres) were identified during field verification. These areas were subsequently mapped and excluded from proposed harvest units.

Surface Erosion and Mass Movement

In the forest environment, surface erosion occurs when exposed soil is detached and transported by water. Most undisturbed soils in the Lab Bay Project Area are resistant to surface erosion due to a relatively thick, organic surface layer which absorbs large quantities of water and protects the soil from displacement. If this layer is removed, the underlying soil is subject to rapid erosion.

Mass wasting is the dominant process of natural erosion and slope reduction in geologically youthful Southeast Alaska (Swanston 1969). Mass movement occurs where the topography is steep and the soil materials are weakened to the point that they can no longer resist the downslope component of gravity. The stability of a slope is determined by soil strength, soil depth, groundwater accumulation, slope gradient, and vegetation characteristics.

Areas of natural mass wasting are associated with oversteepened slopes within narrow V-notch tributary drainages and the steep, upper sideslopes of U-shaped valleys. The upper reaches of glacial till, and the till/bedrock interface on the sides of U-shaped valleys are often the zones of landslide initiation. Pockets of lacustrine sediments overlain by glacial till also create particularly unstable conditions. Natural landslides occur most frequently on slopes steeper than 68 percent during periods of high-intensity rainfall (Swanston 1969). The increasing volume of water moving through the soil causes an increase in shear stress, due to rising seepage pressures



	Organic	McGilvery	Mineral	Till	Riparian
Description	Thick layer, partly to decomposed plant materials	Forest litter and partly decomposed plant material over bedrock	Shallow to deep soils developing in residuum or colluvium	Thin surface, soils developing in glacial till	Shallow to deep soils of stratified sand and gravel
Texture	Mucky peat	Peat	Sandy loam to silt loam	Sandy loam to silt loam	Sand and gravel
Soil Depth	7" to > 6'	< 8"	1' to > 6'	< 20" to < 6'	> 6'
Drainage	Poorly and very poorly drained	Well drained	Well to poorly drained	Well to poorly drained	Well to moderately well drained
Major Forest Types	Nonforest and varied forest types	Western hemlock	Western hemlock, mixed conifer	Western hemlock, Western hemlock/ yellowcedar	Sitka spruce
Landform	Ridgetops, benches, depressions, valley floor	Upper backslopes of hills and mountains	Valley floors, hillslopes, mountain sideslopes, ridgeslopes	Moraines, drumlins, and valley floor deposits	Floodplains, stream terraces
Mass Movement Index Class	Generally low	Low	Low to very high	Low to very high	Low
Timber site Productivity Class	Low to moderate	Medium to high	Medium to high	Medium to high	High
Wetland Habitat Potential	High	Low	Medium	Medium	Very high

and increasing weight of the soil material, and a decrease in shear resistance, resulting from increased pore-water pressure in the soil (Swanston 1970).

Two types of debris slides occur in the Project Area: those initiated in shallow soils over bedrock on extremely steep slopes, and those where soils derived from glacial till slide over compact, unweathered till on moderately steep slopes. Organic soils and soils derived from limestone typically have a low susceptibility to mass movement.

Swanston (1991) evaluated landslides greater than 100 cubic meters occurring between 1963 and 1983 in southeast Alaska. He determined that 77 percent were of the debris avalanche and debris flow type that involve movement of water-charged soil, rock, and organic material down shallow gullies and hillslope depressions. The remaining 23 percent were debris torrents that are generally confined within deeply incised gullies and canyons. Sixty-two percent of all landslides initiate on slopes having an average gradient steeper than 75 percent, and an additional 30 percent develop on slopes between 56 and 75 percent. Landslides also appear to have a limited range of elevation, with 72 percent of all failures occurring below 1320 feet elevation.

Mass movement indices (MMI's) have been assigned to each soil mapping unit according to the relative potential for mass movement. The MMI classification has been developed and revised over 16 years by Ketchikan Area soil scientists. The MMI is based on slope, drainage, bedrock characteristics, soil characteristics, existing landslides, and vegetation.

Areas having a very high MMI have not been included in the suitable timber base for the Lab Bay Project. These include shallow, fine-textured soils on slopes of 75 percent or greater, as well as some soils with restricted drainage (overlaying compact, unweathered till) on slopes in excess

Field work included soil sampling and verification of soil mapping units (SMU's).

of 65 percent. Visible indicators of very high MMI conditions include slide scarps, jack-strawed trees, and a distinct change to relatively young vegetation or disturbance-preferring plant communities. Large, natural slide paths vegetated with Sitka alder are evident in the Buster Creek, Marble Creek, and Calder Creek watersheds. Nearly all of the naturally occurring landslides in the Project Area are within areas mapped as very high MMI soil areas.

Very few actively eroding debris slides were observed in the Project Area during the 1992 field investigations. A fresh debris slide was observed on a steep slope east of Red Lake (VCU 533) and another west of El Capitan Peak (VCU 536). Both were in areas that had not been harvested or affected by road construction. Both areas were re-classified as very high MMI soils and not included in the suitable timber base for this project.

Very high MMI soils occur primarily in VCU's 530, 531.1, 534, 534.2 and 536 (Table 3-11). Most of the very high MMI soils occur within the west fork of the upper Salmon Bay Lake watershed, upper Big Creek watershed, head of Marble Creek, sideslopes of the western fork of Calder Creek, and sideslopes of Buster Creek.

VCU's with more than one-third of the total area in high and very high MMI soils are 529, 530, 531.1, 533 and 534. High MMI soils occur primarily where past glacial scour or fluvial erosion has resulted in steep valley sideslopes. While very high MMI soils are fairly limited in extent, all major watersheds in the Project Area include areas of high MMI soils.

Table 3-11

Area of Very High and High Soil Mass Movement Index Class for Lab Bay Project Area (in acres, with percentage of VCU in parentheses)

	Mass Movement Index (Acres)				
VCU	Very High	(Percent)	High	(Percent)	Total Acres in VCU
527	76	(<1)	462	(4)	13,168
528	6	(<1)	1,270	(30)	4,384
528.1	33	(<1)	490	(6)	8,084
529	0		5,914	(37)	16,093
530	100	(<1)	5,137	(41)	12,507
531.1	178	(1)	8,910	(47)	17,810
531.3	16	(<1)	638	(13)	5,052
532	82	(<1)	2,813	(14)	19,994
533	86*	(<1)	6,906	(51)	13,559
534	200	(2)	4,136	(46)	8,991
534.1	4	(<1)	392	(16)	2,468
534.2	109	(2)	1,378	(22)	6,363
534.3	26	(<1)	67	(1)	7,961
534.4	0		740	(30)	2,434
535	14	(<1)	1,308	(17)	7,779
536	350*	(4)	2,343	(26)	9,108
537.1	9	(<1)	2,015	(18)	11,027
538	2	(<1)	2,315	(18)	13,219
539	33	(<1)	1,493	(12)	12,658
540	4	(<1)	596	(8)	7,526
551	37	(<1)	1,614	(10)	16,029

Source: Ketchikan Area GIS

* Adjusted to include additional areas of very high MMI soils identified during field verification.

Effects of the Alternatives

Soil disturbance is an unavoidable consequence of timber harvest and associated road construction. The severity of soil disturbance varies depending on site conditions and management practices employed. Factors such as parent material, soil depth and drainage, slope gradient, slope shape, slope length, and drainage dissection influence the potential for adverse impacts. Areas most susceptible to adverse impacts have been identified and eliminated from consideration for timber harvest. These areas include very high mass movement hazard soils and very shallow, organic soils (McGilvery Series).

Direct and Indirect Effects

Direct and indirect effects of timber harvest and associated road construction fall into three general categories: reduced soil productivity, accelerated mass wasting, and accelerated surface erosion.

Soil Productivity

Yarding of logs by shovel or cable methods may result in soil displacement and loss of organic surface layers. Steep slopes with thin soils formed directly over bedrock are particularly vulnerable to soil displacement during yarding. Reduced soil productivity and delayed regeneration of commercial tree species occur where disturbance is severe. However, cable systems that partially or fully suspend logs generally cause minimal soil disturbance (Everest et al. 1987). In general, at least partial log suspension is required where slopes exceed 60 percent.

The most significant adverse impact on soil productivity is construction of roads, landings and borrow pits that remove land from the productive base. Implementation of action alternatives would result in loss of soil productivity on the acreage affected by roads, landings, and rock pits, in addition to the areas impacted by ground disturbance during yarding.

Table 3-12 displays the total acres of soil disturbance caused by implementing the proposed alternatives and Table 3-13 displays the expected acres of soil disturbance by VCU. Reduced soil productivity resulting from accelerated soil erosion and mass wasting is discussed in the next section. The following assumptions were used in developing this table:

- The area at risk of significant soil disturbance, when averaged over all cable and shovel logging harvest acres, is 10 percent of the harvested area. There is no significant ground disturbance from yarding logs in helicopter-logged units.
- The area disturbed from roads and landings is equal to an average of 37.5 feet on each side of the road center line, or 9.1 acres per mile.
- 0.5 acres of soil area are disturbed for each rock pit, and there is 1 rock pit for every 1.75 miles of road.

Implementation of Alternative 2 requires the greatest amount of road construction and greatest acreage of timber harvest. Thorne Island (VCU 551) would have the largest amount of road construction and soil disturbance of all the VCU's in the Project Area. Impacts to Thorne Island would be the same under Alternatives 2, 3 and 5. Alternatives 4 and 6 would harvest small patches of timber by helicopter from this area and would not result in any significant soil disturbance on Thorne Island.

Alternatives 3 and 5 involve approximately 250 acres of soil disturbance in harvest units and 500 acres of road construction and rock pits. Disturbed areas are greatest in VCU's 529 and 533 (generally the Alder and Red Creek watersheds) and 551 (Thorne Island) under Alternative 3, while harvest and road construction is spread more evenly between VCU's in Alternative 5. Soil disturbance under Alternative 4 would be similar to Alternative 5, with the exception of Thorne Island, which would be helicopter yarded under Alternative 4. Alternative 6 would involve the least amount of harvest and road construction of the action alternatives. Alternative 6 also includes helicopter yarding on Thorne Island.

Table 3-12
Total Acres of Soil Disturbance from Timber Harvest, Roads, Landings and Rockpits

	Alternatives					
	1	2	3	4	5	6
Acres Soil Disturbed	0	1,082	765	654	784	407

Source: Ketchikan Area GIS

Table 3-13
Acres of Soil Disturbance Resulting from Timber Harvest (TH) and Construction of Roads, Landings, and Rock Pits (RD) by VCU

VCU	Alt. 1 Acres TH[1]	Alt. 1 Acres RD[2]	Alt. 2 Acres TH	Alt. 2 Acres RD	Alt. 3 Acres TH	Alt. 3 Acres RD	Alt. 4 Acres TH	Alt. 4 Acres RD	Alt. 5 Acres TH	Alt. 5 Acres RD	Alt. 6 Acres TH	Alt. 6 Acres RD
527	0	0	18	32	0	0	6	13	18	32	0	0
528	0	0	13	21	12	18	7	10	6	11	12	18
529	0	0	52	107	43	78	35	93	9	38	26	64
530	0	0	28	65	6	12	27	59	12	27	6	12
531.1	0	0	15	35	0	0	10	28	5	80	0	0
532	0	0	23	57	15	39	15	29	23	57	6	9
533	0	0	46	68	46	68	10	19	46	68	28	39
534	0	0	17	36	12	30	17	36	17	36	17	33
534.1	0	0	8	20	8	20	8	20	8	200	0	0
534.4	0	0	0	0	0	0	0	0	0	0	0	0
535	0	0	16	29	16	29	16	29	16	29	12	25
536	0	0	6	18	6	9	6	12	3	2	0	0
537.1	0	0	2	15	2	15	2	15	2	15	3	15
538	0	0	8	14	5	9	8	14	0	0	0	1
539	0	0	20	27	1	3	20	27	17	24	10	15
540	0	0	23	40	23	38	23	40	9	23	20	36
551	0	0	58	145	58	145	0	0	58	145	0	0
Total	**0**	**0**	**353**	**729**	**252**	**513**	**210**	**444**	**249**	**535**	**140**	**267**

Source: Ketchikan Area GIS

[1] TH includes acreage within harvest units that may experience reduced soil productivity following harvest activities.

[2] RD includes acreage of soils removed from productivity due to roads and rock pits.

Timber harvest activities can also affect soil productivity by influencing drainage characteristics. Road fills can disrupt natural drainage patterns and create poorly drained conditions in previously well-drained areas. This is most likely to occur in marginally productive forest adjacent to muskegs. Reduced drainage creates anaerobic soil conditions for which existing vegetation may be poorly adapted, leading to loss of trees in a previously forested site.

Altered soil drainage can be minimized by proper road design and installation of adequate drainage structures. Altered drainage is likely to occur in an extremely small portion of managed forest lands and, therefore, it is not considered a significant impact. On low to moderate gradient slopes, some soil disturbance may even promote a freer draining microsite.

Soil compaction is the increase in soil bulk density and decrease in porosity resulting from repeated operation of heavy equipment. Compaction of the soil can prevent tree roots from penetrating the soil and taking up nutrients. Compaction can also reduce the capability of the soil to absorb and transmit water. Soil puddling occurs when equipment operates on wet ground, creating ruts or deep tracks that hold water. Both compaction and puddling are more likely to occur in fine silty soils and under saturated conditions.

Soil compaction may occur when machinery runs over the same trail numerous times, such as with shovel logging systems. It may also occur when trees are yarded with ground lead or one-end suspension. Guidelines restricting shovel logging in wet conditions reduce the potential of soil compaction and puddling. No shovel logging is proposed for any units in the Lab Bay Project Area.

Mass Movement

Timber harvest and road construction have the potential to accelerate the rate of erosion over natural conditions. Road and landing construction, borrow pit development, and yarding may increase surface erosion by exposing mineral soil, or reduce slope stability through blasting, loading, or tree removal.

Mass movements (landslides) are the dominant erosional processes on steep slopes, and their frequency of occurrence and soil movement rates are increased by logging and road construction (Swanson et al. 1987). Landslides may be triggered by road building activities such as blasting, excavating, and sidecasting, which change the load stress on slopes. Roads may also accelerate the frequency of landslides by re-directing or accumulating water, creating increased pore water pressure and shear stress on unstable slopes.

Tree roots have a stabilizing effect on soil stability because the roots create an interconnected network that provides lateral strength within the soil mantle. Tree roots may also anchor the soil mass when they penetrate cracks in the bedrock or compact till. After trees are cut, roots tend to decrease in strength 3 to 5 years after harvest, resulting in an increased likelihood of soil mass movement on steep slopes (Swanston 1969). Windthrow along proposed harvest unit boundaries may also lead to increased mass movement.

The soil mass movement index (MMI) developed for the Ketchikan Area rates the relative potential for soil mass movement to occur. Table 3-14 shows the acres of harvest and road construction on high and very high MMI soils by VCU. No timber harvest or road construction would occur in VCU's 528.1, 531.3, 534.2, 534.3, or 534.4.

Alternative 2 would result in the most disturbance of high MMI soils (2,242 acres); Alternative 6 would disturb the least (1,167 acres). Alternatives 3, 4, and 5 would result in disturbance of 1,804, 1,368, and 1,734 acres of high MMI soils, respectively. Under most action alternatives, the largest acreages of high MMI soils would be disturbed in VCU's 529, 531.1, 533, 535, 536, and 551 (generally the Alder, Big, Red, Calder, Salmon Bay Lake, and Lava Creek watersheds, and Thorne Island). VCU's 529 (Alder Creek), 533 (Big Creek) and 551 (Thorne Island) would have the greatest amount of road construction on high MMI soils under Alternatives 2, 3, and 5. Alternative 4 would have more roads in high MMI soils in VCU's 529 and 530 (Buster Creek). Alternative 6 does not involve any harvest or road construction on high MMI soils in VCU's 527 (Port Protection), 531.1 (Calder Creek), 532 (Red Bay) or 538 (108 Creek). High MMI soil

areas have the greatest risk of experiencing a mass movement triggered by management activities.

Table 3-14

Acres of Timber Harvest (TH) and Road Construction (RD)[1] on High and Very High MMI Soils[2]

VCU	Alt. 1 Acres TH[1]	Alt. 1 Acres RD[2]	Alt. 2 Acres TH	Alt. 2 Acres RD	Alt. 3 Acres TH	Alt. 3 Acres RD	Alt. 4 Acres TH	Alt. 4 Acres RD	Alt. 5 Acres TH	Alt. 5 Acres RD	Alt. 6 Acres TH	Alt. 6 Acres RD
527	0	0	13	4	0	0	0	0	13	4	0	0
528	0	0	83	12	83	12	25	1	57	10	83	12
529	0	0	304	47	282	38	127	37	89	24	136	30
530	0	0	169	29	42	8	155	26	110	20	42	8
531.1	0	0	305	24	65	0	142	16	134	6	0	0
532	0	0	53	12	53	12	53	4	53	12	0	0
533	0	0	555	32	531	32	289	9	555	32	361	17
534	0	0	100	17	66	13	100	17	100	17	100	17
534.1	0	0	0	0	0	0	0	0	0	0	0	0
535	0	0	121	4	121	4	121	4	121	4	94	4
536	0	0	183	20	69	10	97	12	27	2	0	4
537.1	0	0	18	5	18	5	18	5	18	5	18	5
538	0	0	23	1	14	1	23	1	0	0	0	0
539	0	0	71	7	23	1	71	7	48	7	71	7
540	0	0	53	11	53	11	53	11	21	8	53	11
551	0	0	191	46	191	46	94	0	191	46	94	0
Total	**0**	**0**	**2,242**	**271**	**1,611**	**193**	**1,368**	**150**	**1,537**	**197**	**1,052**	**115**

Source: Ketchikan Area GIS

1 RD is based on an average estimated road clearing width of 75 feet, equal to 9.1 acres per miles of road.

2 No timber harvest will occur on MMI=4 (very high) soils. Of the acres displayed, road construction includes 1.7 acres on MMI=4 soils in VCU 530 for Alternatives 2, 4 and 5; all other road construction is on MMI=3 (high) soils.

Swanston (1991) assessed landslides greater than 100 cubic yards (CY) that occurred over a 20 year period (1963-1983) in southeast Alaska. He found that 118 landslides, or about 9 percent of the 1,395 observed landslides, were located in clearcut areas or were directly associated with timber harvest activities. Landslide frequency in undisturbed areas (with no harvest or roads) was 0.002 landslides per square km per year, and 0.007 landslides per square km per year in clearcut areas, an increase of 3.5 times.

Assuming that the Lab Bay Project Area is representative of the terrain included in Swanston's study, and that the 20-year study period represents climatic conditions that will continue into the future, a rough approximation of landslide occurrence following implementation of alternatives can be made (Table 3-15). Under Alternative 1 (No Action), an estimated 42 landslides would

occur in the Project Area during the next 20 years. Implementation of Alternatives 3, 4, 5, or 6 would result in a net increase of approximately 2 landslides, for an estimated total of 44 landslides. Alternative 2, which involves the greatest acreage of harvest, would result in a net increase of 4 landslides over the No Action Alternative.

Table 3-15

Estimated Landslide (Greater Than 100CY) Occurrence Resulting from Alternatives, According to Landslide Frequency Determined

	Number of Landslides in Next 20 Years					
	Alt. 1	**Alt. 2**	**Alt. 3**	**Alt. 4**	**Alt. 5**	**Alt. 6**
Clearcut areas	20	24	22	22	22	22
Undisturbed areas	22	22	22	22	22	22
Total	**42**	**46**	**44**	**44**	**44**	**44**

Source: Swanston 1991

Surface Erosion

Due to the considerable amount of vegetative groundcover remaining within harvest units during and after timber harvest, surface erosion (including sheet, rill and gully erosion) would be limited in extent. Surface erosion could occur if poor management practices expose mineral soils or if cable yarding causes trenches which concentrate water runoff.

Surface erosion is more likely to occur on exposed road surfaces and shoulders. Roads in the Project Area are constructed with blasted quarry rock, which minimizes road surface erosion. Frequent vehicular traffic, however, breaks down the gravel surface material into fine particles. Limestone surfacing, which is used on most roads in the Project Area, quickly breaks down into very fine particles. Surface runoff during storm events transports this fine sediment to drainage ditches and streams, resulting in increased turbidity.

Lacking quantitative estimates of sediment yield from road surfaces in southeast Alaska, the best evaluation of potential surface erosion from roads is comparison of the miles of open and closed roads. Roads which remain open after harvest activities and have higher traffic levels have greater potential for surface erosion than roads that are closed. Many of the roads constructed for the Lab Bay Project would be closed after harvest is completed. Table 3-16 displays the miles of roads to be constructed for implementation of alternatives. (Delivery of sediment from roads to streams is discussed in the section on Water Resources).

Table 3-16

Miles of New Road Remaining Open and Closed by Alternative

	Alt. 1	**Alt. 2**	**Alt. 3**	**Alt. 4**	**Alt. 5**	**Alt. 6**
Closed	0	74.5	52.2	44.4	53.7	26.1
Open	0	3.3	2.5	2.9	3.3	2.6
Total	**0**	**77.8**	**54.7**	**47.3**	**57.1**	**28.7**

Source: Ketchikan Area GIS

Alternative 2 would result in over 77 miles of new road construction, while Alternative 6 would develop the fewest miles (approximately 29 miles). After harvest, road densities would be similar under all action alternatives totalling approximately 0.96 miles of open road per square mile. VCU 551 (Thorne Island) would have the greatest total amount of road construction (15 miles) under Alternatives 2, 3, and 5. This VCU would experience the greatest increase in surface erosion, if these alternatives are implemented. Alternatives 4 and 6 would not involve any road construction on Thorne Island.

Cumulative Effects

Cumulative effects considers the combined effect of past, present, and future timber harvest activities on soil disturbance, erosion, and mass wasting. Cumulative effects can result from multiple activities that take place on the same site, or the combined effects of activities spread across the landscape. In the Lab Bay Project Area, timber harvest and related activities have been conducted since 1954. Aside from some limited "high-grade" logging (removal of individual, desirable trees), multiple entries have not occurred on the same site, nor are they anticipated to occur within the projected timeframe. Therefore, cumulative effects considered here are the combined effect of past, present and future harvest activities spread throughout the Project Area, rather than repeated activities on a single site.

The effects of road construction, use, and maintenance are the most persistent and constitute the greatest potential for cumulative effects (Geppert, Lorenz and Larson 1984). Table 3-17 displays the cumulative acreage affected by road construction for each VCU in the Project Area. Table 3-17 also displays the total acreage of harvest units within each VCU. Although soil disturbance is usually restricted to less than 15 percent of an activity area, total harvested acres is used in order to portray the total area affected by management activities in each VCU.

Past timber harvest and road construction has affected the largest area in VCU 538, which includes the 108 and Snoose Creek drainages. This VCU has relatively gentle terrain and a low proportion of very high and high mass movement hazard soils (Table 3-11), and most of the units were harvested prior to 1976. These previously harvested areas and associated temporary roads are protected with dense vegetation at present, and erosion rates are close to pre-disturbance levels. The least disturbance has occurred in VCU's 528.1, 531.3, 534.2 and 534.3, which are in land allocations which preclude timber harvest. VCU 551 (Thorne Island) has also had little disturbance; small areas along the coast were harvested in the mid-1960s but no road construction has occurred to date.

Following implementation of action alternatives, VCU's 528, 529, 531.1, and 538 would have over 25 percent of the area affected by timber harvest and road construction. Of these, VCU's 528 (Hole-in-the-Wall basin) and 529 (Alder Creek) have the highest proportion of very high and high mass movement hazard soils. Alternative 2 (full unit pool) would result in the greatest cumulative area affected by timber harvest and road construction, while Alternative 6 would affect the least area.

Table 3-17

Cumulative Acres Affected by Timber Harvest (TH) and Roads (RD)* Under Existing Conditions and Following Implementation of Alternatives

	Existing Acres of		Alt. 2 Acres		Alt. 3 Acres		Alt. 4 Acres		Alt. 5 Acres		Alt. 6 Acres	
VCU	TH	RD	TH	RD	TH	RD	TH	RD	TH	RD	TH	RD
527	1,723	167	1,929	199	1,723	167	1,807	180	1,929	199	1,723	167
528	1,034	97	1,175	118	1,150	115	1,115	107	1,095	108	1,150	115
528.1	224	13	224	13	224	13	224	13	224	13	224	13
529	3,311	325	3,841	432	3,755	403	3,360	418	3,403	363	3,597	389
530	1,912	168	2,195	233	1,971	180	2,181	227	2,036	195	1,971	180
531.1	2,332	189	2,700	224	2,419	189	2,516	217	2,535	197	2,332	189
531.3	179	4	179	4	179	4	179	4	179	4	179	4
532	5,528	304	5,762	361	5,677	343	5,677	333	5,762	361	5,588	313
533	1,649	168	2,350	236	2,301	236	1,970	187	2,350	236	2,083	207
534	1,159	72	1,330	108	1,279	102	1,330	108	1,330	108	1,327	105
534.1	293	9	376	29	376	29	376	29	376	29	293	9
534.2	54	1	54	1	54	1	54	1	54	1	54	1
534.3	300	0	300	0	300	0	300	0	300	0	300	0
534.4	552	43	552	43	552	43	552	43	552	43	552	43
535	1,404	143	1,598	172	1,598	172	1,598	172	1,598	172	1,561	168
536	1,451	183	1,640	201	1,551	192	1,580	195	1,481	185	1,451	183
537.1	2,401	193	2,422	208	2,422	208	2,422	208	2,422	208	2,426	208
538	6,170	522	6,254	536	6,221	531	6,254	536	6,170	522	6,170	523
539	2,538	205	2,798	232	2,615	208	2,798	232	2,709	229	2,703	220
540	845	89	1,078	129	1,072	127	1,078	129	936	112	1,042	125
551	536	0	1,112	145	1,112	145	754	0	1,112	145	754	0
Total	**35,595**	**2,895**	**39,869**	**3,624**	**38,551**	**3,408**	**38,125**	**3,339**	**38,553**	**3,430**	**37,480**	**3,162**

Source: Ketchikan Area GIS

* Assumes the area disturbed from roads and landings is equal to a clearing limit of 75 feet, or 9.1 acres per mile of road plus one 0.5 acre rock pit for each 1.75 miles of road.

Mitigation Measures

Forest Plan standards and guidelines are designed to minimize accelerated soil erosion and to maintain the inherent long-term soil productivity within the levels of the Soil Quality Standards (FSH 2509.18 and R10 Supplement 2500-92-1). The minimum soil quality standard requires that 85 percent of an area be maintained in a condition of acceptable productivity for trees and other managed vegetation following land management activities. A minimum percentage of ground cover is also required to be maintained: the effective ground cover must be at least 85

percent on slopes less than 35 percent, 90 percent on slopes from 35-75 percent, and 95 percent on slopes greater than 75 percent.

The standards and guidelines also call for reduction of soil impacts by implementation of Best Management Practices (BMP's). BMP's to protect soil during timber harvest include limiting the operating period of timber sale activities to avoid wet soil conditions (BMP 13.4), protection of alluvial soils with shallow organic layers (BMP 13.8), protection of wetlands during harvest (BMP 12.5 and BMP 13.5), proper log landing location and design for erosion control (BMP 13.10), revegetation of areas disturbed by harvest activities (BMP 13.12), and suspended log yarding to reduce soil disturbance (BMP 13.9). In general, at least partial suspension is required on high MMI soils. BMP guidelines are provided for determining suitability for shovel logging (BMP 13.7) based on site conditions.

BMP's have also been developed to minimize erosion related to road construction, use and maintenance. These include construction timing restrictions (BMP 14.6), slope stabilization measures to minimize mass failures (BMP 14.7) and surface erosion (BMP 14.8), control of road drainage (BMP 14.9), pioneer road construction guidelines (BMP 14.10), control of excavation and sidecast material (BMP 14.12), maintenance of roads (BMP 14.20), and obliteration of temporary roads (BMP 14.24).

These BMP's are designed to reduce erosion caused by timber harvest and road construction, use and maintenance. They apply to all harvest units and roads proposed for all alternatives in the Lab Bay Project Area. Implementation of BMP's will result in a reduction of the acreage of soil disturbance displayed in Table 3-13. Specific mitigation measures for harvest units and road locations with special concerns are described on the harvest unit and road design cards (Planning Record).

Monitoring

The Forest Plan recognizes three distinct types of monitoring: implementation, effectiveness, and validation. Implementation monitoring determines if projects and activities comply with Forest Plan standards and guidelines. Effectiveness monitoring determines whether the standards and guidelines achieve the desired results. Validation monitoring determines whether the assumptions in the Forest Plan regarding the relationship between management actions and their effects are correct, or if there is a better way to depict these relationships.

A monitoring plan has been developed for the Tongass National Forest by the Forest Planning Team and is described in the TLMP Draft Revision (1991a). In accordance with the 1992 Memorandum of Agreement between the Alaska Department of Environmental Conservation and the USDA Forest Service Alaska Region, the Forest Service will perform BMP implementation and effectiveness monitoring. The Lab Bay Project Area can contribute towards meeting overall Forest Plan monitoring goals through the selection of proposed harvest units/roads for monitoring. Recommendations for monitoring the soil resources for the Lab Bay Project Area have been documented in the Soils and Water Resource Report (Metzler 1993) and the project planning record.

Project-specific monitoring that is unique to the Lab Bay Project Area, and that would not be included in regular Forest Plan or routine implementation monitoring, has been identified for several resources. Project-specific monitoring is not identified for soil resources in the Lab Bay Project Area.

Chapter 2 summarizes how project activities relate to Forest Plan and Ketchikan Area monitoring plans, and describes project-specific monitoring opportunities.

Water Resources

Key Terms

Bedload - Sand, gravel, or soil and rock debris rolled along the bottom of a stream by the moving water.

Best Management Practices (BMP's) - Land management methods, measures or practices intended to minimize or reduce water pollution. Usually BMP's are applied as a system of practices rather than a single practice. BMP's are selected on the basis of site-specific conditions that reflect natural background conditions and political, social, economic, and technical feasibility.

Discharge - The volume of water moving through a stream channel over a given time period.

Fines - Soil particles less than 2 mm in diameter, usually transported as suspended load in a stream.

Mass Movement/Wasting - General term for a variety of processes by which large masses of earth material are moved by gravity either slowly or quickly from one place to another.

Nephelometric Turbidity Units (NTU) - A unit of measure for turbidity, related to the light-inhibiting properties of a fluid.

Sediment - Solid material, in suspension or transported by water, gravity, ice, or air.

Turbidity - An expression of the optical property that causes light to be scattered and absorbed rather than transmitted in straight lines through a water sample; turbidity in water is caused by the presence of suspended matter such as clay, silt, finely divided organic and inorganic matter, plankton, and other microscopic organisms.

Affected Environment

Timber harvest activities may alter natural water yield and/or affect the quality of water. The present condition of water quality and quantity is described in this section.

Water Yield

Streamflow is generated primarily by processes operating outside of the stream channel (Harr 1976). There are 238 different minor watersheds in the Lab Bay Project Area; each of these contributes runoff to a different stream. The minor watersheds are grouped together into major third and fourth order watersheds, which influence a larger stream system (Figure 3-6). There are 46 major third- and fourth-order watersheds within the Project Area.

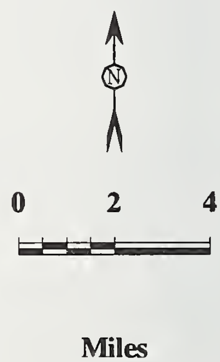
Overall watershed conditions influence both streamflow and water quality in streams and lakes. Natural characteristics of watersheds, such as basin shape, drainage density and basin relief, influence streamflow by affecting how fast water is routed through the basin. Geologic materials affect the natural rate of erosion and sediment supply to the stream. In Southeast Alaska, where soils are shallow and frequently saturated, streamflows rise rapidly in response to rainfall. This type of discharge produces considerable energy which allows large amounts of both suspended and bedload sediments to be transported.

Vegetation also affects the amount and timing of water available for streamflow. Evapotranspiration plays a major role in determining the baseflow characteristics of a basin (Bartos 1989). In forested areas, the amount of water available for streamflow may be increased by timber harvest,

Figure 3-6
Watershed Map

Legend

A04A - Watershed Number



Source: Ketchikan Area GIS

although storage capacity may be decreased. Precipitation falling on muskegs, which are usually saturated and have little additional storage capacity, runs off rapidly into stream channels.

Vegetation in many of the watersheds in the Project Area has been altered by timber harvest and road construction conducted between 1954 and 1992. Forty-two of the 46 third and fourth order watersheds have been previously entered for timber harvest. Table 3-18 provides a summary of the existing watershed conditions.

Table 3-18
Summary of Existing Conditions in Third and Fourth Order Watersheds

Number of Watersheds	Total % of Watershed Currently Harvested
12	< 10%
25	10-35%
4	36-50%
5	> 50%

Source: Metzler 1993

Forest-wide draft standards and guidelines (TLMP Draft Revision 1991a) propose a cumulative watershed effects (CWE) analysis when more than 35 percent of a third-order or larger watershed is proposed for harvest within a 15 year period. Planning for the Lab Bay Sale incorporated these draft standards and guidelines. As shown in Table 3-18, more than 35 percent of the watershed has been harvested in 9 watersheds in the Project Area. In seven of these watersheds, the harvest has occurred since 1979, and further harvest as part of the Lab Bay Project would require a CWE analysis. These watersheds are A09A and A10A (unnamed drainages east of Red Bay), A12A (Duck Creek), A15A (Strait Creek), A21A (unnamed drainage northeast of Red Bay), A25A (unnamed drainage south of Port Protection) and watershed A55A (unnamed drainage on the east side of El Capitan Passage). Due to the extent of previous timber harvest in these seven watersheds, no harvest is proposed in them under any of the Lab Bay Project alternatives.

The Lab Bay Sale was designed to comply with the standards and guidelines for fisheries protection in the TLMP (1979, as amended) and the TLMP Draft Revision (1991a). The recently published 1996 TLMP Draft Revision provides updated standards and guidelines for protection of riparian, water quality, and fisheries resources. The Lab Bay unit design, proposed mitigation, and analysis of effects is consistent with the updated standards and guidelines. Watersheds proposed for harvest under the Lab Bay sale were reviewed to determine the extent of past harvest and road building; extent of high and very high MMI soils; riparian resources; and fisheries concerns including passage, temperature sensitivity, and access. The level of harvest proposed and specific unit prescriptions take into account existing watershed conditions as well as site-specific conditions within and adjacent to the units. The analysis and sale design is consistent with the watershed analysis approach proposed in the 1996 TLMP Draft Revision.

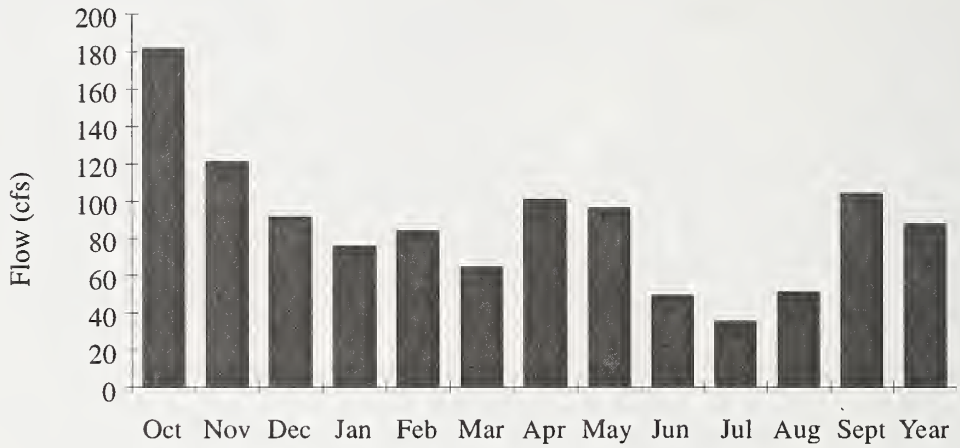
Flow Regime

Consistent with rainfall patterns, streamflows in the Project Area are highest in October and November (Figure 3-7). Snowmelt runoff during April and May often results in a secondary peak flow period. Winter stream freshets, resulting from warm rain following snowfall, can also result in high peak flows of short duration. Watersheds with a southeast exposure and elevations less than 500 feet are most vulnerable to these events. 108 Creek (also called Big Creek on

ADF&G stream catalog) and Snoose Creek have a large proportion of their watershed area below 500 feet and a general southeast exposure, and, thus, a higher vulnerability to "flashy" winter peak flows.

Lowest flows generally occur between June and August. Base streamflow is dependent on water retained in the relatively shallow soils and wetlands within the Project Area watersheds. Rapid loss of base flow occurs during periods of low precipitation. Low streamflows may also occur during prolonged winter cold snaps when high pressure cells move in from the Canadian interior.

Figure 3-7
Big Creek Mean Monthly Flow, Average of Water Years 1964-1981



Source: Metzler 1993

Water Quality and Use

Water quality affects the suitability of water for use by people, fish, and wildlife. Water quality within streams and lakes of the Project Area is generally good to excellent. State Water Quality Standards (18 AAC 70.020) set criteria according to the beneficial use of the water. In the Lab Bay Project Area, the most common existing water use is for the natural propagation of fish and shellfish.

Small streams and springs within and adjacent to the Project Area are also used for drinking water supply. Residents of Port Protection rely on a community water supply system fed by springs draining from National Forest system lands to the east of the community (ADEC 1984). Residents of Point Baker, Calder, El Capitan and Whale Pass also use springs and small streams originating from National Forest System lands. Because of the highly karstic nature, water can travel very rapidly from the surface to spring outlets. This may make drinking water supplies very susceptible to disturbance. No industrial or commercial water use is currently taking place in the Project Area.

Water quality characteristics which influence these beneficial uses, and that may be affected by timber harvest and associated activities, include sediment and turbidity, temperature and dissolved oxygen, stream chemistry, and bacteria.

Sediment and Turbidity

The amount of particulate matter, or sediment, carried or suspended in water affects both fish habitat and human use of the resource. Streams transport both suspended sediment (primarily silt and clay-size particles) and bedload (coarse sands or larger particles). Fish habitat is af-

fected by both the availability of sediment and the subsequent routing of these materials through the channel (Everest et al. 1987).

In the Project Area, existing sediment sources include: 1) natural streambank erosion and mass wasting, 2) soil disturbance and mass wasting related to existing harvest areas and roads, 3) road construction activities, such as bridge and culvert installation, and 4) road use and maintenance. Road construction activities, such as bridge and culvert installation are known to cause temporary increases in sediment.

The amount of sediment in a stream depends not only on the source of sediment, but on the stream energy available for transport. Sediment movement is pulse-like rather than constant. Sediment initially accumulates near the source, in roadside ditches and small headwater stream channels, and then is mobilized during storm events. During high flow, sediment is transported throughout the channel, but as the flow wanes, sediment is selectively transported from riffles and deposited in pools (Lisle and Hilton 1992). Different types of stream channels respond differently to increased sediment loads: high gradient channels tend to transport sediment while lower gradient channels store sediment (see the discussion of Stream Process Groups in the Fisheries Section). Very low gradient, estuarine channels are highly vulnerable to sedimentation.

Alaska water quality criteria require that turbidity (a measure of suspended sediment) not exceed 25 nephelometric turbidity units (NTU's) above natural conditions for propagation of fish. For all lake waters, turbidity shall not exceed 5 NTU's over natural conditions.

During storm events, runoff from the surfaces of logging roads causes temporary increases in turbidity in streams in the Project Area. This is particularly evident where Road #20 crosses Red, Big, Alder and Flicker Creeks, just upstream of their estuaries. Water quality criteria also require that fine sediment (0.1 mm to 4.0 mm) concentration may not increase by more than 5 percent or exceed a total of 30 percent by weight in stream gravels (ADEC 1989).

For springs and streams that supply drinking water, turbidity shall not exceed 5 NTU above natural conditions, and no increase in the concentration of sediment, including settleable solids, is allowed.

Temperature and Dissolved Oxygen

Water temperature is a primary regulator of biological activities in the aquatic environment. The metabolic activities of fish and most other aquatic organisms are controlled by the temperature of the water in which they live. Stream temperature also determines how much oxygen is available for fish: the higher the water temperature, the less dissolved oxygen it can hold.

A stream's temperature depends on both the amount of shading over the water surface as well as the upstream source of the water. Streams which have their source within, or flow through muskegs or lakes, have a higher base temperature than streams which originate from groundwater or alpine sources. Volume of water, stream gradient, and streambed materials also influence stream temperature.

State water quality standards (ADEC 1989) have established upper temperature limits between 55.4°F and 59°F for propagation of fish, and an upper limit of 59°F for drinking water.

Timber harvest can result in loss of shade and increased stream temperatures. While high stream temperatures are generally not a concern in cool and cloudy Southeast Alaska, small streams have been shown to reach temperatures that inhibit salmonid growth and cause mortality (Gibbons et al. 1987). During field reconnaissance, several relatively small streams which flow through muskeg, have a low gradient, and have large width to depth ratio were identified as potentially temperature sensitive. These small, unnamed streams are primarily located on the low lying, coastal plain south of Sumner Strait, in the northern portion of the Project Area. Reduction of stream shading on these streams, or their tributaries, could result in adverse increases in stream temperatures.

Stream temperatures are higher in streams such as 108 Creek where timber harvest occurred within the riparian area in the 1960's. Monitoring by the USGS between 1963 and 1980 revealed maximum daily temperatures of 61°F to 74°F in June, July and August. Along most of the fish-bearing streams in the Project Area, however, timber harvest has not occurred within the riparian area and maximum stream temperatures are considerably cooler than those measured in Big Creek.

Water Chemistry

Water erodes rock and dissolves minerals, resulting in organic and inorganic matter within even pristine streams and lakes. While chemical analysis of the waters of Southeast Alaska has been sparse, it is generally assumed that chemical water quality is good. Streams that flow through areas underlain by limestone have a relatively high pH and high concentration of dissolved nutrients, making them highly productive waters for salmon and trout.

Water quality samples of Pyramid Creek and Odd Rock Creek, small streams located on the southwest side of El Capitan Passage, revealed total dissolved solids (TDS) concentrations and pH well within State of Alaska water quality criteria for domestic water supplies as well as for propagation of fish (Table 3-19).

Table 3-19
Summary of Chemical Analysis of Streams Near the Lab Bay Project Area

Stream	Measured pH	Measured TDS*	Alaska Criteria pH	Alaska Criteria TDS*
Pyramid Cr	6.8-6.9	18-29	6.0-8.5	<500 (drinking water)
Odd Rock Cr	7.2-7.4	52-59	6.5-9.0	<1500 (fish habitat)

Source: Metzler 1993

* TDS = Total dissolved solids, in milligrams per liter

Potential pollutants such as herbicides and fertilizers have not been used in the past, and are not anticipated for the future. The main threats of chemical pollution are from accidental spills of petroleum products.

Bacteria

Fecal bacteria are carried in the intestinal tract of humans and other warm-blooded animals, and are shed in feces (EPA 1976). Increased human access to a watershed increases the potential for fecal contamination downstream. Many of the domestic water users in the Project Area vicinity rely on springs which are fed by underground sources and do not require disinfection. In the limestone terrain surrounding several of these communities, however, there may be surface connections to these springs. Underground channels within the limestone rapidly transmit, rather than filter, the water. Thus, these springs may be highly susceptible to any nearby source of contamination.

Fecal coliform bacteria have been adopted as the measure of bacterial contamination by the EPA as well as the State of Alaska. State water quality criteria for fecal coliform (FC) bacteria in drinking water supplies require that the mean of a minimum of 5 samples taken in a period of 30 days shall not exceed 20 FC/100 ml, and not more than 10 percent of the samples shall exceed 40 FC/100 ml (ADEC 1989).

In the Project Area, human use is dispersed and relatively low in the watershed areas affecting water supplies of domestic users. Data on existing levels of bacteria in these water supplies are not available.

Effects of the Alternatives

Timber harvest and related activities have the potential to affect water quality and streamflow by accelerating erosion and altering vegetation within the watershed. The degree of effect on water quality, flow regime, channel stability, and fish habitat depends on the inherent characteristics of the stream and watershed, as well as the specific operating procedures employed.

One of the major public issues identified for the Lab Bay Project Area is the effect of the project on fish habitat and water quality. Potential direct, indirect and cumulative effects on water quality are discussed below.

Water Quality

Characteristics of water quality that may be affected by timber harvest and related activities include the amount of sediment supplied to a stream, temperature of the water, dissolved oxygen content, water chemistry, and bacteria concentrations. Effects on each of these parameters is discussed in the following sections.

Sediment

Although only a small percentage of the total land base is affected by mass wasting and surface erosion, a large proportion of the stream system can be affected by direct runoff of sediment from erosion and subsequent sediment transport downstream (Everest et al. 1987). Disturbance within a watershed may affect the volume, timing, and grain size of sediment contributed to streams (Sullivan et al. 1987). Actual effects depend on the intensity of disturbance, areal extent of disturbance, and proximity of the disturbance to the channel system.

Road corridors are the major source of management-related sediment in a watershed. New road construction, grading of cuts and fills, ditching, and installation of culverts exposes soil to erosional forces. The majority of increased sediment transfer lasts for a period of two to five years following initial road construction. Cederholm and Lestelle (1974) found increases in fines in the bed of the Clearwater River, Washington, and related the increases to the amount of roading in the basin. Substantial increases in fine sediments were observed in the Harris River, Alaska, after logging, returning to normal five years after harvest (McNeil and Ahnell 1964). Numerous other studies document increased sediment loads related to timber harvest, road construction, road use and maintenance. Increases in fine sediment due to installation of stream crossing structures are usually temporary and dissipate within 48 hours if best management practices are applied.

The duration of the sediment input from roads is related to the road maintenance class. Most local roads are closed once logging of a unit is completed. Drainage structures are removed. This type of road has a lower duration of sediment input than long-term, collector roads, which remain open to use. Vehicular traffic and road maintenance activities continue to generate sediment from these roads, although the amount will be greatly reduced over time.

Eroded material generated by road use and maintenance is normally routed to roadside ditches and through culverts; the potential to reach a fish-bearing stream depends on the distance from the disturbed area to a stream channel and the capacity of the intervening terrain to hold and store sediment. For material originating from slope failures, the mobility of the sediment depends on the type of failure, the water content of the sediment, the sediment composition, and the location of the failure on the landscape. For example, landslides that enter first- and second-order stream channels can transition into debris flows and travel up to thousands of yards. Shallow landslides occurring on open slopes may only move several hundred feet, and broad valley floors can intercept and trap the sediment before it reaches a fish-bearing stream.

Direct Delivery

Proposed harvest units and roads have been rated for the potential to directly deliver sediment to a Class I stream by alternative (Tables 3-20 and 3-21) (Metzler 1993). Ratings are based on soil mass movement index, distance from the unit or road to a stream channel, and topography. The sediment delivery rating does not reflect the likelihood of erosion to occur on a given area but,

rather, assuming that soil is eroded, the likelihood of sediment reaching a stream channel. Harvest units and roads that are rated as having a high potential for direct sediment delivery are those that are located on steep slopes that drain directly to a Class I stream flowing through a narrow valley bottom. It is important to note that there would not be any timber harvest on slopes with a very high hazard of mass movement under any alternative. All harvest units located on slopes with a high mass movement hazard were examined in the field by a hydrologist, and appropriate mitigation measures were prescribed (see Unit and Road Cards, Planning Record). Table 3-20 displays the harvest units with a high potential for direct delivery of sediment to a Class I stream.

Table 3-20

Harvest Units with High Potential* for Direct Sediment Delivery to a Class I Stream

VCU	Unit	Acres of High MMI	Watershed	Alternative 1	2	3	4	5	6
527	226	13	A24A		X			X	
529	259	14	A18A		X	X	X		
529	285	33	A18A		X	X	X		
530	234	28	A17A		X	X	X		X
532	221	1	A06A		X	X	X	X	
533	224	15	A30B		X	X	X	X	X
533	245	30	A31C		X	X		X	X
533	246	50	A31C		X	X		X	
533	247	2	A31C		X	X		X	
551	224	59	B29A		X	X		X	
No. of Units With High Sediment Delivery Potential				**0**	**10**	**9**	**5**	**7**	**3**
Acres in Units With High Sedimentation Potential				**0**	**245**	**232**	**91**	**170**	**89**

Source: Metzler 1993

X = Unit included in alternative

* 'High Potential' indicates that there is a high likelihood that sediment would reach a Class I stream if erosion does occur within the harvest unit. BMPs would be implemented in all of these units to prevent or minimize erosion.

Relatively few proposed harvest units have a high direct sediment delivery potential because most of the Class I streams have a wide, flat valley bottom that effectively traps sediment before it reaches the stream channel.

Most of the units with a high potential for direct delivery of sediment to a Class I stream are located in the Buster, Alder, and Big Creek watersheds (A17A, A18A, and A31C) where the valley sideslopes are steep and the valley bottoms are narrow. Alternatives 2 and 3 involve the greatest number of units and largest acreage of high sedimentation potential. Therefore, Alternatives 2 and 3 have the highest risk of directly delivering sediment to a Class I stream; Alternative 5 has a lower risk; and Alternatives 4 and 6 have the lowest risk of the action alternatives.

Measures to minimize direct sediment delivery will be implemented in each of the units under all of the action alternatives. A buffer of vegetation, 120 to 200 feet wide would be maintained between the harvest unit and Class I stream. In order to minimize soil disturbance, at least partial suspension of logs during yarding would also be required in areas of high mass movement hazard.

Roads with the highest potential for direct sediment delivery either cross a Class I stream or are located on the lower valley slopes, close to a Class I stream (Table 3-21). Since sediment can be generated from the road surface, as well as the cut and fill slopes associated with a road, all roads, regardless of mass movement hazard of the terrain, were rated for direct sediment delivery potential.

Table 3-21
Road Segments with High Potential* for Direct Sediment Delivery to a Class I Stream

Road #	Access to VCU	Access to Unit	Watershed	Total Road Miles	Alternative 1	2	3	4	5	6
647617	527	226	A24A	0.7	0	0.7	0.0	0.0	0.7	0.0
647610.1	529	285	A18A (Alder)	0.2	0	0.2	0.2	0.2	0.0	0.0
647717	530	200	A16A	0.2	0	0.2	0.0	0.2	0.0	0.0
6417719	530	240	A17A (Buster)	0.3	0	0.3	0.0	0.3	0.0	0.0
657720	531.1	257	NEW3	0.1	0	0.1	0.0	0.0	0.1	0.0
647829.3	532	221	A06A	0.2	0	0.2	0.2	0.2	0.2	0.0
66805	539	222	A48A	0.1	0	0.1	0.0	0.1	0.1	0.1
66804	540	206	A50A	0.1	0	0.1	0.1	0.1	0.1	0.1
667925	540	223	A53A	0.1	0	0.1	0.1	0.1	0.0	0.1
668028	551	220	B30A	0.4	0	0.4	0.0	0.4	0.4	0.0
Total Miles With High Sediment Delivery Potential					**0**	**2.4**	**1.0**	**1.2**	**1.6**	**0.3**
Number of Road Segments					**0**	**10**	**5**	**7**	**6**	**3**

Source: Metzler 1993

* 'High Potential' indicates that there is a high likelihood that sediment would reach a Class I stream if erosion does occur along the road prism. BMPs would be implemented to minimize erosion on these road segments.

Alternative 2 has the highest risk of direct sediment delivery from roads, since this alternative involves 10 segments and 2.4 miles of road with high delivery potential. Alternatives 3, 4, and 5 have a slightly lower risk. Alternative 6 has the lowest risk, with 3 segments and 0.3 miles of road having high potential for direct sediment delivery to a Class I stream. The road segments with high potential for sediment delivery under Alternative 6 cross three small, unnamed streams in the vicinity of Exchange Cove and Whale Pass.

Measures to minimize sediment delivery will be implemented on each of these road segments under all of the action alternatives. These measures include diverting road drainage toward areas that can filter sediment; diverting flows around construction sites; and timing of construction activities to minimize sediment delivery during critical periods for salmon. When these measures are implemented, increased fine sediment due to installation of stream crossing structures usually dissipates within 48 hours.

During the 1992 field investigations, an improvement opportunity was identified in the Flicker Creek watershed. This involves an area where sidecast from Road 2087120 has created an

approximately 10 acre area of mass wasting and erosion downslope from the road bed. The area should be hydromulched and planted with trees to provide for long-term stabilization.

Indirect Delivery

There is also potential for sediment to reach a Class I stream if it is routed through an upstream Class II or III tributary. The potential for such indirect sediment delivery is displayed in Tables 3-22 and 3-23. Indirect sediment delivery potential is based on a combination of the sediment delivery potential to a Class II or III stream, and the ability of this stream to transport sediment to the nearest Class I stream.

Numerous harvest units have a high potential for indirect sediment delivery because they border or include high gradient, Class III streams. Such stream channels have little storage capacity and rapidly deliver sediment to downstream Class I streams. Measures to minimize sediment delivery to the high gradient, potentially unstable Class III streams include directionally falling trees away from the stream and yarding the logs away, so that streambanks are not disturbed; fully suspending logs when yarding over streambanks; retaining trees within the inner gorge that help stabilize the streambanks; retaining stable (nonlogging-related) woody debris in the high gradient channels to serve as sediment traps; and achieving at least partial suspension of logs when yarding areas of high hazard soils. These BMPs would be applied in all harvest units where there is a concern for direct sediment delivery to Class II and III streams.

Table 3-22

Acreage of Harvest Units with High Potential* for Indirect Sediment Delivery to a Class I Stream

	Alternatives					
VCU	1	2	3	4	5	6
528	0	82	82	25	57	82
529	0	119	119	61	103	119
530	0	133	14	28	119	14
531.1	0	276	55	142	125	0
532	0	42	42	42	42	0
533	0	423	423	244	423	256
534	0	55	21	55	55	55
535	0	79	79	79	79	50
536	0	183	69	97	27	0
537.1	0	0	0	0	0	0
538	0	0	0	0	0	0
539	0	88	23	88	65	23
540	0	38	38	38	0	38
551	0	19	19	0	19	0
Total Acres	**0**	**1536**	**984**	**897**	**1115**	**637**

Source: Metzler 1993

* 'High Potential' indicates that there is a high likelihood that sediment would reach a Class II or III stream and be routed to a Class I stream if erosion does occur within the harvest unit. BMPs would be implemented in all of these units to prevent or minimize erosion.

Alternative 2 has the greatest acreage of harvest units with a high potential for indirect sediment delivery to a Class I stream. These harvest units occur primarily in the Big Creek (VCU 533), Calder Creek (VCU 531.1), Lava Creek (VCU 536), Alder Creek (VCU 529), and Buster Creek (VCU 530) watersheds. Alternative 5 involves the second greatest acreage of harvest units with a high potential for indirect sediment delivery to a Class I stream, and Alternatives 3 and 4 involve somewhat fewer acres. Alternative 6 involves the fewest acres and has the lowest risk for indirect sediment delivery resulting from harvest units.

The potential for indirect sediment delivery from roads is displayed in Table 3-23. In general, roads with low potential for sediment delivery are located on ridgetops, and those located on upper valley sideslopes have a moderate potential. Roads with a very high or high potential are located on mid- or lower valley sideslopes and cross high gradient, Class III streams capable of transporting sediment to a Class I stream.

Table 3-23
Miles of Roads with High Potential* for Indirect Sediment Delivery to a Class I Stream

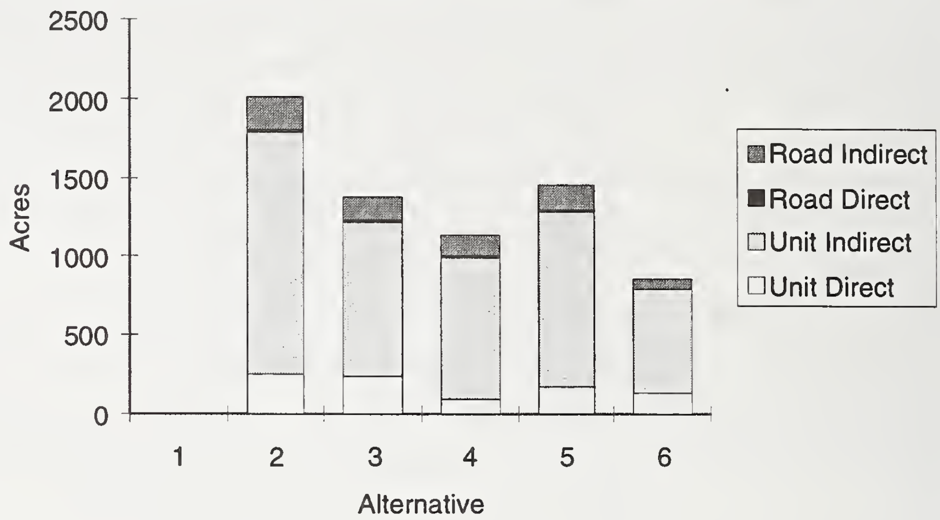
	Alternatives					
VCU	**1**	**2**	**3**	**4**	**5**	**6**
527	0	0.2	0.0	0.0	0.2	0.0
528	0	1.0	0.6	0.6	0.4	0.6
529	0	2.2	1.9	1.2	1.3	1.9
530	0	3.0	0.9	2.3	2.1	0.9
531.1	0	4.8	2.2	4.8	2.2	0.0
532	0	0.7	0.6	0.6	0.7	0.0
533	0	4.2	4.2	0.8	4.2	1.4
534	0	0.3	0.3	0 3	0.3	0.2
534.1	0	0.3	0.3	0.3	0.3	0.0
535	0	0.1	0.1	0.1	0.1	0.1
536	0	0.9	0.7	0.9	0.2	0.0
537.1	0	0.0	0.0	0.0	0.0	0.0
538	0	0.2	0.2	0.2	0.0	0.0
539	0	2.0	0.6	2.0	1.4	1.1
540	0	1.5	1.5	1.5	1.2	1.5
551	0	2.2	2.2	0.0	2.2	0.0
Total	**0**	**23.4**	**16.2**	**15.4**	**16.6**	**7.7**

Source: Metzler 1993

* 'High Potential' indicates that there is a high likelihood that sediment would reach a Class II or III stream and be routed to a Class I stream if erosion occurs along the road prism. BMPs would be implemented to minimize erosion along these road segments.

Figure 3-8

Acres of Harvest Units and Roads with High Potential for Delivery of Sediment to a Class I Stream



Source: Metzler 1993

Alternative 2 involves the greatest risk of indirect sediment delivery to a Class I stream, since it involves the greatest amount of road construction. Alternatives 3, 4, and 5 involve a similar risk of indirect sediment delivery to a Class I stream from roads, the primary difference being that no roads would be constructed on Thorne Island under Alternative 4. Most of the roads with a high potential for indirect sediment delivery are located in the Alder Creek (VCU 529), Buster Creek (VCU 530) Calder Creek (VCU 531.1), Big Creek (VCU 533), Exchange Creek (VCU 540), and Thorne Island (VCU 551) watersheds. Alternative 6 involves the least risk of indirect sediment delivery from roads. Under Alternative 6, no roads would be constructed on Thorne Island (VCU 551) and many of the higher risk roads included in the other action alternatives would not be constructed.

Measures to minimize indirect sediment delivery from roads include hydroseeding the cut-and-fill slopes to establish a protective cover on exposed soil, directing road runoff to densely vegetated slopes where sediment is trapped before reaching a Class I stream, and properly sizing culverts over Class III streams to prevent plugging and road washout during storm events.

Figure 3-8 summarizes the results of a risk assessment for proposed roads and harvest units in the action alternatives. It indicates that Alternative 6 has the lowest overall risk of sediment delivery to Class I streams. Alternatives 3, 4, and 5 have slightly higher risks, associated with roads and harvest units, and Alternative 2 has the highest risk due to the greatest direct delivery potential from both roads and harvest units.

Temperature and Dissolved Oxygen

Timber harvest has the potential to seasonally elevate stream temperatures if streamside shading is reduced. A minimum 100-foot-wide buffer strip would be retained along all Class I and II streams. Buffer strips are the most effective means for preventing water temperature change after logging (Brown 1980). Buffer strips of 100 feet or more generally provide the same level of shading as that of an old-growth stand (Beschta et al. 1987).

Some timber harvest would occur within 100 feet of Class III streams. Class III streams are typically not prone to significant increases in temperature because of their small surface area and high gradient, allowing little time for the water to heat up.

Fish kills have been documented in Calder Creek and El Capitan Creek (Lynch pers. comm.). Although the exact cause of the kills has not been determined, high stream temperature may have been a contributing factor, since increased water temperature decreases the availability of dissolved oxygen. Three harvest units are proposed within the El Capitan Creek watershed under Alternative 2 (full unit pool). One unit (536-211) is located on the east fork of the creek and also would be harvested under Alternatives 4 and 5. Two units (536-208 and 536-209) are located on the west fork and would be harvested under Alternatives 3 and 4. The unit on the east fork is on the north side of the valley, upstream of the fish-bearing portion of Calder Creek. A 70- to 100-foot-wide buffer would be retained along the stream. The other two units are located 150 to 300 feet from the stream due to the presence of muskeg and nonmerchantable timber in the streamside area. The portion of the stream near these units is not particularly sensitive to increased temperatures due to the incised nature of the stream and moderately steep gradient. No increase in stream temperature is anticipated under any of the alternatives since vegetative buffers have been retained.

One unit (531.1-230) is proposed within the Calder Creek watershed under Alternatives 2 and 4. This unit is located adjacent to a small, steep gradient tributary, where topographic and vegetative shading will remain after harvest. The distance upstream from the fish-bearing mainstem (2,000-3,000 feet) makes a significant temperature increase unlikely.

No significant impacts on stream temperature or dissolved oxygen are anticipated from implementation of any of the action alternatives.

Water Chemistry

Release of nutrients and inorganic compounds after logging is a function of several soil, vegetative, and climatic characteristics. In forest ecosystems of Southeast Alaska, dissolved nutrients are tightly bound by soil organic matter and plant root hairs (Paustian and Kelliher 1992). Vigorous revegetation of shrub and tree species within disturbed areas helps to restore the nutrient cycle. The normal sequence of harvest and reforestation poses little threat to the chemical quality of water in forest systems (Brown 1980).

Action alternatives will, however, result in an increased risk of pollution from accidental spills of petroleum products. The risk of spills is highest at landing areas and along roads.

Bacteria

Increased access to watersheds which supply domestic water users increases the potential for bacterial contamination of water supplies. As shown in Table 3-24, there would be a temporary increase in access to three known domestic supply watersheds in the Port Protection area during harvest of adjacent units under Alternatives 2 and 5. Alternatives 2, 3, and 4 would result in a temporary increase in access to the watershed supplying Whales Resort and 3 families. Alternative 6 does not include any timber harvest within watersheds supplying domestic users.

In the Spring Creek watershed, dye tracing investigations would be conducted to determine the source of the spring-fed stream prior to road construction if Alternatives 2 or 5 are implemented. Streams typically emerge from karst groundwater systems in the Project Area. The direction of the flow through these systems cannot be predicted from surface topography or geologic mapping. Field studies in the Project Area have demonstrated that waters that enter the karst groundwater system in one topographic basin often may be discharged from springs in different basins (see Geology, Minerals and Karst Resources, Chapter 3). Following dye tracing, appropriate road design and/or location adjustments would be implemented.

During harvest activities, it is recommended that chemical toilets be placed in work areas to reduce the risk of bacterial contamination, pursuant to state regulations. Roads accessing Units 527-206, 527-226, and 538-210 would be closed at the junction with an existing road system immediately following timber removal. After road closure, increased human use of these watershed areas will not be significantly increased over existing conditions.

Table 3-24

Effect of Alternatives on Access to Known Domestic Water Supplies

Watershed	Users	Impact	Alternative
Spring Cr.	Port Protection	No harvest in watershed, but nearby road access for Unit 527-226 adjacent to watershed boundary	2, 5
Cove Cr.	Port Protection	No harvest in watershed, but nearby road access for Unit 527-206 adjacent to watershed boundary	2, 5
Unnamed	Whales Resort and 3 Families	Unit 538-210: 11 acres within watershed, 0.3 miles new road access Unit 540-221: 30 acres within watershed	2, 3, 4

Source: Metzler 1993

Cumulative Effects

The cumulative effect of past, present, and future activities must be considered when analyzing impacts of proposed activities on streamflow. While removal of trees in an individual harvest unit may have little effect on streamflow in a large watershed, the incremental effects of many harvest units throughout a watershed could significantly alter the timing and volume of runoff.

Water Yield

Removing or reducing mature forest cover reduces water loss from evapotranspiration and interception, increasing the water available for streamflow. In the Pacific Northwest, timber harvesting has been shown to increase the annual streamflow, summer flow, and small (usually fall) peak flows. Larger peak flows may be increased when seriously compacted soil (such as on road surfaces and heavily used skidtrails) occupies at least 12 percent of the watershed (Harr 1976).

In the Project Area, the peak flows occur during high intensity storm events in October and November when the shallow soils are saturated and there is little storage capacity remaining within the watershed. Under such conditions, changes in interception or evapotranspiration rates would not substantially affect the magnitude of peak flows.

Bartos (1989) evaluated changes in USGS stream gaging data for Staney Creek (17 miles south of Neck Lake) and found a significant increase in the low flow discharge after trees had been removed from 35 percent of the drainage. Over the long term, a decrease in summer baseflow could occur due to establishment of a dense second-growth stand, particularly if the riparian area had been harvested. In a completely clearcut watershed, Hicks et al. (1991) found an increase in August water yield that lasted for 8 years, followed by a decrease that has continued for 18 years. However, in a 25 percent patch cut watershed, he found an increase in August water yield that persisted for 16 years, followed by a return to pre-harvest levels. A relatively wide valley floor in the completely clearcut watershed allowed development of hardwoods in the valley bottom, which transpire more water than the previously-existing conifers.

Under all alternatives, less than 10 percent of the area of most third and fourth order watersheds would be harvested in this entry. The exception is in seven small watersheds, ranging in size from 180 to 820 acres. Watershed A53A, an unnamed watershed east of Whale Pass, would have the greatest percentage (24 percent) of the watershed area affected under implementation of Alternatives 2, 3 or 4. There has been no previous harvest in this watershed. All of the action alternatives would also result in harvest of approximately 11 percent of watersheds A04A and

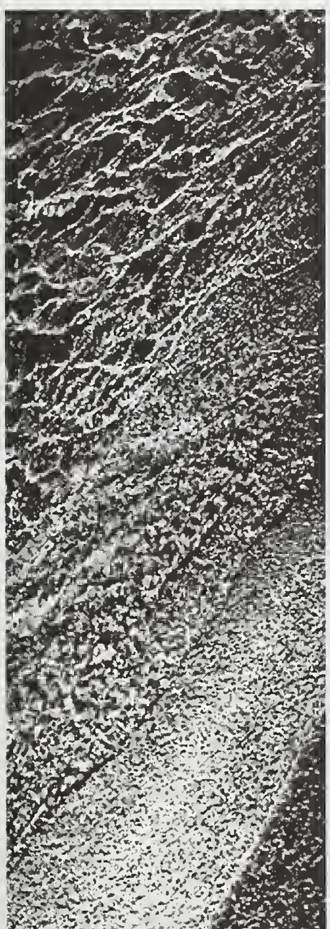
A06A (unnamed watersheds east of Red Bay). Alternatives 2, 4 and 5 would harvest 16 percent of watershed AK4A (unnamed watershed west of Exchange Cove). Alternatives 2, 3 and 5 involve harvest of 11 to 18 percent of watersheds B29A, B31A and BD4A on Thorne Island.

Harvest units included in all of the action alternatives are located primarily in watersheds where less than 10 percent of the area had been previously harvested (Metzler 1993). Since most of the existing harvest entries occurred prior to 1988, by 2004 all of the third and fourth order watersheds would be well within the Forest Plan standard and guideline calling for no more than 35 percent of third order or larger watersheds to be harvested within a 15 year period. All of the proposed alternatives will meet this guideline. None of the action alternatives include harvest units in a watershed where more than 35 percent of the area has been harvested in the 15 years prior to 1994.

Furthermore, riparian vegetation along all Class I streams and Class II streams that flow directly into Class I streams will be protected by a no-harvest buffer of a least 100 feet in width. In wider, alluvial valley bottoms, this buffer has been extended to widths greater than 100 feet in order to protect side channels and wet soils. These streamside buffers should also be effective in preventing long term changes in the rate of evapotranspiration by riparian vegetation that could affect summer baseflows.

Mitigation Measures

The primary mechanism to protect water quality and fish habitat during forest practices is the proper application of Best Management Practices (BMP's). BMP's are listed in the Soil and Water Conservation Handbook (FSH 2509.22). In addition, the 1990 TTRA mandates a minimum 100-foot buffer on all Class I streams and on Class II streams that flow directly into a Class I stream. Forest Plan standards and guidelines allow for the width of this buffer strip to be increased beyond 100 feet (measured horizontally) for reasons such as topography, fragile riparian soils, a windfirm boundary, timber stand boundaries, logging systems requirements, and varying stream channel locations. In addition, many Class III streams have been buffered to the slope break of the channel or to a wind resistant boundary to protect water quality and prevent significant increase in stream temperature. Selective harvest buffers which retain the more wind resistant trees are prescribed along numerous Class III stream channels.



BMP's to protect water quality streams (Class III) include designating water quality protection needs on sale area maps (BMP 13.3), stream channel protection measures (BMP 13.16), suspended log yarding (BMP 13.9), protection of potentially unstable areas (BMP 13.5), and revegetation of areas disturbed by harvest activities (BMP 13.12).

In addition to those BMP's directed at reducing erosion and mass wasting related to road construction and maintenance (listed in the Soils section), the following BMP's apply to reducing road-related impacts on water quality: timing restriction for construction activities (BMP 14.6), control of road drainage (BMP 14.9), control of in-channel operations (BMP 14.14), diversion of flows around construction sites (BMP 14.15), stream crossings on temporary roads (BMP 14.16), and bridge and culvert design and installation (BMP 14.17).

In the domestic supply watersheds, chemical toilets would be placed onsite during road construction and harvest activities in order to reduce the risk of bacterial contamination. Roads would be closed at the junction with an existing system road immediately following timber removal. Furthermore, geotechnical investigations and tracer dye studies are required prior to construction in the vicinity of Spring and Cove Creek watersheds. These studies are necessary to determine the extent of surficial influence on these domestic watersheds in karst terrain.

The Unit and Road Design Cards (Planning Record) describe specific measures to protect water quality and fish habitat where special concerns exist.

Monitoring

The Forest Plan recognizes three distinct types of monitoring: implementation, effectiveness, and validation. Implementation monitoring determines if projects and activities comply with Forest Plan standards and guidelines. Effectiveness monitoring determines whether the standards and guidelines achieve the desired results Validation monitoring determines whether the assumptions in the Forest Plan regarding the relationship between management actions and their effects are correct, or if there is a better way to depict these relationships.

A monitoring plan has been developed for the Tongass National Forest by the Forest Planning Team and is described in the TLMP Draft Revision (1991a). In accordance with the 1992 Memorandum of Agreement between the Alaska Department of Environmental Conservation and the USDA Forest Service Alaska Region, the Forest Service can perform BMP implementation and effectiveness monitoring. The Lab Bay Project Area will contribute towards meeting overall Forest Plan monitoring goals through the selection of proposed harvest units/roads for monitoring. Recommendations for monitoring the water resources for the Lab Bay Project Area have been documented in the Soils and Water Resource Report (Metzler 1993) and the project planning record.

Project-specific monitoring that is unique to the Lab Bay Project Area, and that would not be included in regular Forest Plan or routine implementation monitoring, has been identified for several resources. Water resources are included in project-specific monitoring for the Port Protection and Whales Resort domestic watersheds. These monitoring activities are described in Chapter 2 of this document.

Floodplains, Riparian Areas, and Wetlands

Key Terms

Estuarine - Deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land, have open, partly obstructed or sporadic assess to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land.

Floodplain - That portion of a river valley, adjacent to the river channel, which is covered with water when the river overflows its banks at flood stages.

Lacustrine Wetland - Includes permanently flooded lakes and reservoirs, intermittent lakes, and tidal lakes with ocean-derived salinities of less than 0.5 percent. Typically, there are extensive areas of deep water and there is considerable wave action.

Muskeg (peatlands) - A type of bog that has developed in depressions, or flat areas, poorly drained, acidic, with organic soils that support vegetation that is predominantly sphagnum mosses and heaths.

Palustrine Wetland - Pertaining to swamps or marshes and to material deposited in a swamp environment.

Riparian Area - The area including a stream channel, lake or estuary bed, the water itself, and the plants that grow in the water and on the land next to the water.

Riparian Management Area (RMA) - The area including water, land and plants that is at least 100 slope feet away from each side of perennial streams, lakes and other bodies of fresh water, as defined in the Stream and Lake Protection LUD.

Riverine Wetland - A category in wetland classification which includes all wetlands and deepwater habitats contained within a channel, with two exceptions: (1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and (2) habitats with water containing ocean-derived salts in excess of 0.5 percent.

Wetlands - Areas that are inundated by surface or groundwater with a frequency sufficient to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include muskegs, marshes, bogs, wet meadows, river overflows, mud flats, and natural ponds.

Affected Environment

Floodplains

A floodplain is the valley floor inundated by a river or stream during high water periods. Naturally-eroded sediments carried by the floodwaters are deposited in slack water reaches of the floodplain, where they accumulate to form nutrient-rich soils. Floodplains are among the most productive sites found on the Tongass National Forest for timber, wildlife, and fisheries. Changes to the rate, or quantity, of sediment deposition within the floodplain have the potential to affect these resources.

Federal agencies are directed (Executive Order 11988) to provide leadership and take action on Federal lands to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains. Under the TLMP Draft Revision (1991a), floodplains are managed through implementation of the Stream and Lake Protection LUD, and standards and guidelines for protection of riparian areas. For management purposes,

floodplains are defined as the area subject to a one percent (100-year recurrence) or greater chance of flooding in any given year.

Within the Lab Bay Project Area, several streams support a well-developed floodplain, including Alder Creek, Buster Creek, Big Creek, Red Creek, Salmon Bay River, 108 Creek, and Calder Creek.

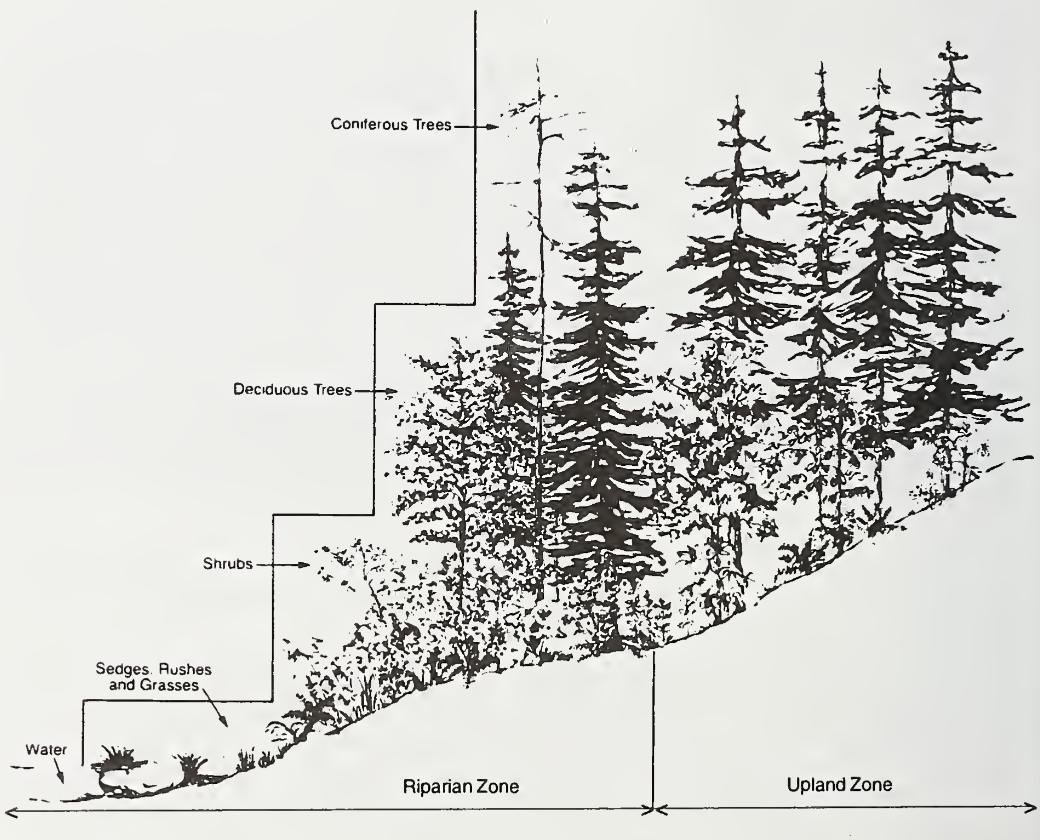
Previous timber harvest and road-building activity has occurred within floodplain landforms. In the Project Area, a total of 289 acres within the floodplain landform has been harvested, and 38 acres are occupied by roads (based on an average 75-foot road width). Stream channels within the Floodplain Process Group currently are spanned by 27 road crossings. In particular, VCU's 531.1 and 538 show a high degree of harvest and road building.

Riparian Areas

Riparian areas are aquatic habitats such as lakes, streams, and estuaries, and the lands adjacent to them. The aquatic and terrestrial elements of a riparian area typically are closely related and interdependent. For example, soil saturation and composition influences the plant species found adjacent to the waterbody, while plant species composition influences stream shading, water temperature, and bank stability. Riparian areas, particularly on low elevation floodplain sites, are highly productive environments for fish, timber, and wildlife resources. Forested riparian areas often serve as travel corridors for deer between low elevation winter range and higher elevation summer range.

The National Forest Management Act (NFMA) requires that riparian areas be established to protect water quality and fisheries habitat. The Tongass Timber Reform Act (1990) specifies protection requirements for salmon-bearing streams. The TLMP Draft Revision (1991a) provides for protection of riparian-related resources under the Stream and Lake Protection LUD, and standards and guidelines for riparian and other related resources.

Under the Stream and Lake Protection LUD, administrative riparian management areas (RMA's) are defined based on stream channel type and adjacent soils. Riparian management areas in-



clude perennial streams, bodies of water with actively flowing fresh water, bodies of fresh water inhabited by fish, and estuaries, along with the lands adjacent to these aquatic habitats. The adjacent lands are those dominated by riparian vegetation and those adjacent nonriparian lands with potential to influence water quality. A minimum of 100 feet (horizontal distance) on each side of the waterbody is included within the riparian management area.

The riparian management area is comprised of four primary components, each with different management requirements (TLMP Draft Revision 1991a).

1. No Commercial Harvest Buffer: A minimum 100-foot buffer is applied to each side of all Class I streams and Class II streams that flow directly into Class I streams, as specified in the Tongass Timber Reform Act (1990). No commercial harvest is allowed within the buffer, although limited clearing for road building is permitted.
2. No Programmed Harvest Buffer: This buffer is applied primarily to alluvial fan, floodplain, and estuary channel types, and is additional to the no commercial harvest buffer, if the latter is present. Programmed harvest activities are precluded within this buffer, but salvage and individual tree cutting may occur.
3. Selective Harvest Buffer: A selective harvest buffer is designated on several channel types, including some of the alluvial fan and floodplain process groups, and many lakes. Within this buffer, selective harvest of trees is allowable in accordance with specific direction provided in the Stream and Lake Protection LUD. The Selective Harvest Buffer is additional to any No Commercial or No Programmed Harvest buffers present on a stream reach.
4. Planning Level Zone: All channel types not receiving at least one of the first three buffer components are included in the planning level zone (minimum 100-foot width). The area within this zone is available for harvest while meeting riparian area management objectives for fish habitat and water quality, as specified in the Stream and Lake Protection LUD.

Each of the four RMA components is extended to include adjacent riparian or very high mass movement soils. (For detailed discussion of these soil types, please refer to the Soils section).

Appendix L presents the minimum RMA component widths for all channel types in the Lab Bay Project Area. These widths are applied to each side of a stream channel. In addition, lakes receive buffers based on stream class and size of the waterbody (see Appendix L). Each of the four components may be extended beyond these minimum widths to include adjacent riparian or high mass movement soils, and as dictated by site-specific inventories of riparian conditions. Channel types are described in the Channel Types User Guide (USDA Forest Service 1992b).

Within the Lab Bay Project Area, a total of 28,763 acres is located within riparian management areas. Important riparian management areas coincide with the floodplain areas noted above, and also include the margins of large lakes and wetlands. Table 3-25 indicates the acres of old growth and second growth within each of the four RMA components.

Table 3-25
Acres within Riparian Management Area Components, by Vegetation Type

	Acres		
RMA Component	Total RMA	Old Growth	2nd Growth
No Commercial Harvest Buffer	8,193	4,800	896
No Programmed Harvest Buffer	1,159	627	150
Selective Harvest Buffer	4,332	1,984	445
Planning Level Zone	15,078	8,261	2,866
Total All Components	**28,763**	**15,672**	**4,357**

Source: Ketchikan Area GIS

The Lab Bay Project Area is well roaded, and currently exhibits over 370 miles of road. A total of approximately 94 miles of road (849 acres) is located within riparian management areas (Table 3-26).

Table 3-26
Acres of Existing Road Within Riparian Management Area Components

RMA Component	Acres
No Commercial Harvest Buffer	118
No Programmed Harvest Buffer	188
Selective Harvest Buffer	270
Planning Level Zone	273
Total All Components	**849**

Source: Ketchikan Area GIS

Wetlands

Wetlands are defined as "those areas that are inundated or saturated by surface or groundwater with a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (40 CFR 230.41 (a)(1)). The high precipitation level and glacial terrain of Southeast Alaska have combined to form extensive wetland complexes, including muskegs, estuaries, and forested wetlands.

Executive Order 11990, as amended, requires Federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with the destruction or modification of wetlands. The TLMP Draft Revision (1991a) includes draft Forest-wide standards and guidelines directed at minimizing the loss of wetland acreage and enhancing the values and functions of existing wetlands.

The U.S. Army Corps of Engineers Wetlands Delineation Manual (1987) provides the standard for determining a site's wetland status. In addition, DeMeo and Loggy (1989) have developed

wetland identification procedures specific to Southeast Alaska's vegetation communities. Under COE (1987), sites are considered wetlands when they meet criteria regarding soil, hydrology, and vegetation. Generally, wetlands are those sites that remain water-saturated for sufficient lengths of time that hydrophytic vegetation dominates and certain soil characteristics develop. The DeMeo and Loggy (1989) procedure, used to classify wetlands on the Ketchikan Area, evaluates the vegetation and soil layers of the GIS database and then assumes the presence of the wetland hydrological criteria. In addition, their procedure calculates wetland acreages based on the general percentage of the vegetation and soil types within large scale, remotely mapped soil units. Consequently, the DeMeo and Loggy procedure generates an estimated acreage of potential wetlands rather than a site-specific wetland delineation.

Approximately 97,506 acres (61 percent) of the Lab Bay Project Area are wetlands, of which approximately 10 percent have been harvested. These include wetlands of the palustrine system (open muskegs, freshwater sedge meadows, forested muskegs, and other forested wetlands), estuarine system (emergent sedge and intertidal/subtidal mudflats), lacustrine system (lakes and ponds), and riverine system (streams). The TLMP Draft Revision (1991a; pages 3-423 and 3-424) provides detailed descriptions of the wetland systems and classes. Table 3-27 presents the acres within each wetland system and type found on the Project Area. Riverine values are provided as miles of stream.

Table 3-27
Acres of Existing Wetlands[1]

Wetland System	Wetland Class	Acres	Miles
Palustrine	Forested Wetlands[2]	23,104	
	Forested Muskeg[3]	31,550	
	Open Muskeg[3]	33,980	
Estuarine	Estuarine Emergent	1,331	
	Estuarine Intertidal Mudflat	2,705	
Lacustrine	Lakes	2,375	
Riverine	Rivers & Streams		825
Total Wetland Area		**95,045**	

Source: Ketchikan Area GIS

[1] Many of the wetlands in the Project Area occur in complexes with nonwetlands or other wetland types. A complex is an area of two or more dissimilar vegetation and soil types occurring in a regularly repeating pattern that can be mapped on aerial photographs. Values for this table were derived using percent composition of each vegetation and soil type of the complexes. These percentages were determined during the soil and vegetation survey.

[2] Mineral soils

[3] Organic soils (peatlands)

Muskeg

Open muskegs are the most common wetland type in the Project Area, covering 33,980 acres. These wetlands are found from low to high elevations on slopes and river terraces, and are dominated by sphagnum moss or sedges interspersed with shrubs and stunted trees. Of the total area in open muskeg, approximately 322 acres are mapped as tall sedge muskeg and 7,994 acres as alpine shrubland/muskeg.

Forested muskegs (greater than 10 percent tree cover on organic soils) in the Project Area total 31,550 acres. Lodgepole pine is the dominant tree species on these sites, and is found with other conifers, scrub shrubs, moss, and sedges. Forested muskegs are typically interspersed with open moss muskegs on the Project Area.

Calder Bay Estuary

Forested wetlands occur on 23,104 acres of somewhat poorly drained to poorly drained mineral soils in the Project Area. Mixed-conifer forests predominate on the wetter sites, with a higher proportion of hemlock species on the drier sites. Small open wetlands are typically interspersed throughout the forested wetlands.

Estuaries are unique ecosystems located at the interface of freshwater, terrestrial, and marine environments. Estuaries support marine invertebrates such as clams and crabs, salt water fish, and anadromous fish. These species, in turn, support a wide variety of wildlife, including waterfowl, wading birds, bald eagles, small mammals, and bear. Estuarine emergent sedge communities and estuarine intertidal/subtidal mudflats occupy 1,331 acres and 2,705 acres in the Project Area, respectively. Emergent sedge communities are found in sloughs, terraces between estuary channels, and along adjacent low to mid-level terraces. Inundated by higher tides, these communities are dominated by Lyngbye's sedge, large-awned sedge, red fescue, and sea milkwort. Intertidal/subtidal mudflats are (in part) exposed during low tides and typically are unvegetated. Large estuaries are present at Red Bay, Salmon Bay, Exchange Cove, Whale Pass, Calder Bay, Hole-in-the-Wall, and Port Protection.

Lacustrine wetlands are the open water areas of lakes and ponds. The largest lakes in the Project Area, Red Lake, Salmon Bay Lake, and Twin Island Lake, support both freshwater and anadromous fish. A total of 2,375 acres of lacustrine habitats is present in the Project Area.

Riverine habitats include streams and rivers. Approximately 825 miles of stream are present on the Project Area. Of this total, approximately 293 miles are known or thought to be inhabited by fish. Major stream systems include Alder/Flicker, Buster, Big, Red, Salmon Bay River, 108, El Capitan, Calder and Marble creeks.

Wetland functions are the physical, chemical, and biological processes or attributes necessary to maintain the integrity of the wetland/upland landscape system (Adamus et al. 1987). These functions can be grouped into three classes: hydrologic, including flood flow moderation and groundwater exchange; water quality improvement, including sediment deposition and nutrient exchange; and biologic, including primary productivity, habitat structure, and species diversity. Wetland values are those characteristics of wetlands that are perceived as valuable to society, such as aesthetics, recreational use, commercial fishing, timber harvest, and development sites.

Palustrine wetlands in the Project Area, particularly muskegs, are moderately important to water quality improvement, flood flow alteration, and biological production. Palustrine wetlands generally play an important role in groundwater recharge and discharge. Socio-economic values of palustrine wetlands are generally low to moderate, although forested wetlands on mineral soils can have high economic value.

Estuarine wetlands serve very important biological and water quality functions in relation to primary and secondary productivity, structural and chemical habitat attributes, and species diversity. Hydrologic functions of floodflow alteration and groundwater exchange are of lesser importance in estuarine wetlands. Socio-economic values of estuarine wetlands are generally moderate to high.

Lacustrine wetlands support moderate levels of water quality improvement functions, and moderate to high levels of hydrologic functions. Biologic functions vary from low to high, depending on the size, productivity, and species use of the lake. Aesthetic and recreational values of lakes are generally moderate to high; other socio-economic values are variable in importance.

Riverine wetlands provide high levels of hydrologic functions and moderate to high levels of water quality improvement functions. Biological support varies from low, in small, high gradient mountain streams, to high, in large, low-elevation salmon-bearing streams. Recreational and aesthetic values vary from low to very high, dependent upon stream characteristics, fishing potential, and accessibility. Other socio-economic values are variable in importance.

Effects of the Alternatives

Direct and Indirect Effects

Floodplains

Under Executive Order 11988 agencies are required to: 1) avoid direct or indirect support of floodplain development actions whenever there are practicable alternatives; 2) evaluate the potential effects of proposed action on floodplains; 3) ensure that planning programs and budget requests consider flood hazards and floodplain management; and 4) prescribe procedures to implement the policies and requirements of the Executive Order.

Table 3-28 presents the acres of floodplain landform to be affected by timber harvest and road construction under each of the proposed alternatives. Between 14.8 acres (Alternative 2) and 5.5 acres (Alternative 5) are proposed for harvest within the floodplain land form. An additional 3.3 acres of road construction is proposed within the floodplain under Alternatives 2 and 4, based on estimated average road clearing width of 75 feet (9.1 acres per mile of road). The 75-foot width is an average for all landtypes and slopes. Roads constructed on steep slopes often affect an area greater than 75 feet in width, while those located on gentle slopes and flat ground will typically affect an area much less than 75 feet in width. For example, a 14-foot road finished road surface, constructed with minimum fill on flat terrain would typically require a disturbed area approximately 30 feet wide. Through use of overlay construction techniques, the average area of disturbed soils beneath the road surface, particularly within floodplain landforms, is expected to be less than 9.1 acres per mile. No new road crossings of streams within the Floodplain Process group would occur from implementation of any of the action alternatives.

Table 3-28

Acres of Floodplain Affected by Harvest and Road Construction*

	Total Acres	Previous Harvest	Proposed Harvest Acres Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Timber Harvest	1,798	289	14.8	11.1	9.3	5.5	11.1
Road Construction*	1,798	38	3.3	0.1	3.3	0	0.1

Source: Ketchikan Area GIS

* Based on an estimated average clearing width of 75 feet.

During road construction, both direct and indirect disturbance of floodplains may occur. Modification of channels and streamflows, either locally or upstream of the floodplain, has the potential to alter floodplain hydrology, resulting in different erosion and sediment transport characteristics.

BMP's would be used to minimize impacts on floodplains and related resources including fisheries, wetlands, and riparian areas. The Unit and Road Cards (See Planning Record) present the BMP's assigned as a result of site-specific field inventory.

Riparian Areas

Riparian areas may be affected directly, through harvest and road construction, or indirectly through changes in hydrology, sediment transport, water temperature, or windthrow. Protection of riparian areas is provided by the application of the Stream and Lake Protection LUD and implementation of draft Forest-wide standards and guidelines for riparian areas (TLMP Draft Revision 1991a), and BMP's for road construction as specified in the Forest Service Soil and Water Handbook.

Tables 3-29 and 3-30 present the estimated acres to be affected by harvest and road construction within riparian management area buffers. Note that harvest is not proposed for the No Commercial (TTRA) and No Programmed Harvest buffers under any alternative.

Table 3-29
Acres of Riparian Management Areas Affected by Timber Harvest

RMA Component	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
No Commercial Harvest Buffer	0	0	0	0	0
No Programmed Harvest Buffer	0	0	0	0	0
Selective Harvest Buffer	65	47	25	58	15
Planning Level Zone	326	212	239	200	126
Total All Components	**391**	**259**	**264**	**258**	**141**

Source: Ketchikan Area GIS

Table 3-30
Acres of Riparian Management Areas Affected by Road Construction*

RMA Component	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
No Commercial Harvest Buffer	13.5	4.4	9.5	7.7	2.7
No Programmed Harvest Buffer	1.2	0.9	0.4	1.2	0.4
Selective Harvest Buffer	23.3	15.7	5.2	15.9	3.4
Planning Level Zone	60.4	42.3	36.5	38.5	19.0
Total All Components	**98.4**	**63.3**	**51.6**	**63.3**	**25.5**

Source: Ketchikan Area GIS

* Includes proposed roads and existing roads to be reconstructed; based on an estimated average clearing width of 75 feet.

BMP's would be implemented during road construction for protection of fisheries habitat and water quality. The Unit and Road Cards (Planning Record) present BMP recommendations based on site inventory.

Wetlands

Federal agencies exercising statutory authority and leadership over Federal lands are required under Executive Order 11990 to preserve and enhance the natural and beneficial values of wetlands while carrying out their responsibility for: 1) acquiring, managing, and disposing of lands and facilities; 2) providing federally undertaken, financed, or assisted construction and improvements; and 3) conducting Federal activities and programs affecting land use.

Ongoing silvicultural activities are exempt from the Section 404 permit process. Lands within Land Use Designations III and IV are under Forest Service management for commercial timber harvest. Ongoing timber harvest activities include harvesting, stand improvements, and construction and maintenance of facilities necessary to support the silvicultural activities. Supporting facilities include roads, landings, and quarries or borrow sites.

Locations of proposed roads and harvest units were field-verified by logging engineers along with soils, wetlands, fisheries, and other resource specialists. Road segments were relocated and units modified when necessary to ensure avoidance of impact to high value wetlands. Site-specific design and mitigation were used to minimize the extent of impacts to other wetlands.

BMP's assigned for protection of water quality and fisheries habitat will also serve to protect wetland functions and values.

Wetlands comprise approximately 61 percent (95,045 acres) of the unencumbered National Forest System lands in the Project Area (Table 3-27). Table 3-31 presents the acres of proposed harvest on wetlands by alternative. Implementation of Alternative 2 would result in a projected harvest of 2,695 acres of wetlands, while Alternative 6 would harvest 1,251 acres of wetland habitat. Alternatives 3, 4, and 5 would harvest 2,111, 1,923 and 1,681 acres of wetland habitat, respectively.

Muskegs are generally unsuitable for harvest; however, small muskegs included in larger forested tracts may be affected by harvest and adjacent yarding operations. BMP's would be applied for the protection of water quality and would protect wetland water quality improvement functions. Timber harvest on forested wetlands with mineral soils may temporarily change the hydrology of the site. Patric (1966) suggests an increase in water yield may result from timber harvest. A temporary increase in soil moisture is expected until vegetation is re-established on the site.

Site productivity on wetland soils is typically lower than on more well-drained soils. Concurrently, growth rates are expected to be slower on wetland than on nonwetland sites, and merchantable timber may not be available on a 100-year rotation. The percent of total timber harvest located on wetland soils varies from 54 percent in Alternative 5 to 69 percent in Alternative 3 (Table 3-31).

Table 3-31
Acres of Proposed Timber Harvest on Wetlands*

	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Total Harvest	4,550	3,040	2,919	3,106	1,885
Wetland Harvest	2,695	2,111	1,923	1,681	1,251
Percent of Total	59%	69%	66%	54%	66%

Source: Ketchikan Area GIS

* Proposed timber harvest would occur primarily on forested wetlands; small inclusions of other wetland types may also be harvested.

Table 3-32 presents the estimated acres of wetland types affected by road construction for each alternative. Alternative 2 would affect the greatest area of wetlands (512 acres), while Alternative 6 would affect the smallest area (202 acres). These values are based on an estimated average road clearing width of 75 feet (9.1 acres per mile). Through use of overlay construction techniques, the area of disturbed soils beneath the road surface is expected to be much less, particularly on flat terrain.

Table 3-32
Acres of Proposed Road Construction on Wetlands*

	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Total Acres Proposed Roads	708	498	430	519	300
Acres of Roads on Wetlands	512	399	312	361	202
Percent of Total	72%	80%	73%	70%	67%

Source: Ketchikan Area GIS

* Includes proposed roads and existing roads to be reconstructed; based on an estimated average clearing width of 75 feet.

Construction of new roads on wetlands would be limited to the necessary transportation components of roads, landings, and drainage structures. Road development necessitates the alteration of wetland vegetation within the road right-of-way; however, BMP's would be used to ensure protection of water quality, hydrologic processes, and biological functions of the wetland. BMP's would be applied in cases where use of wetlands as filter strips to capture sediment is a concern. Ditch construction would be minimized on open muskegs to the extent necessary to minimize both water accumulation on the road surface and sediment production. To ensure continuing hydrologic functions of wetlands, culverts and other road drainage features would be located to maintain water levels and flows at natural levels. Rock overlay, a highly permeable fill, would be used to minimize changes to wetland hydrology.

Through application of BMP's, impacts of road construction would be limited to the wetland directly underlying the road and adjacent cuts and fills. Water flows, circulation patterns, and chemical and biological characteristics of the water within wetlands would be maintained. Adverse effects to fisheries habitat would be minimized. Wildlife use of wetlands may be altered by road construction, depending on the species. Small species may be displaced from the immediate roadway; larger species using wetlands as travel corridors and foraging areas may be displaced during periods of vehicular traffic on the roads. Species sensitive to disturbance may be displaced on a long-term basis from roads with high traffic levels.

Cumulative Effects

Riparian Management Areas

Alternative 2 is used to display the effects of reasonably foreseeable future actions to the year 2004. Actions are projected to the year 2054 based on the Lab Bay LSTA. By the year 2004 (under Alternative 2), approximately 5,695 acres within riparian management areas would have been harvested or cleared for road construction (Table 3-33). By 2054, an estimated 11,354 acres within RMA's would have been harvested or cleared for roads under the TLMP Draft Revision (1991a), scheduled timber harvest would occur only in the Selective Harvest and Planning Level components of the riparian management area. The No Programmed and No Commercial (TTRA) Harvest buffers would not be harvested, although some additional road construction would occur within the buffer areas. In addition, implementation of the TLMP Draft Revision (1991a) standards and guidelines would ensure maintenance of cumulative harvest standards for High Gradient Contained stream channel types.

Table 3-33

Cumulative Acres of Timber Harvest and Road Construction Within Riparian Management Areas

RMA Component	Total Area	1954	1995	2004	2054
No Commercial Harvest Buffer	8,193	0	1,014	1,028	1,051
No Programmed Harvest Buffer	1,159	0	338	339	341
Selective Harvest Buffer	4,332	0	715	803	1,586
Planning Level Zone	15,078	0	3,139	3,525	8,376
Total All Components	**28,763**	**0**	**5,206**	**5,695**	**11,354**

Source: Ketchikan Area GIS

It is anticipated that in the future, 1,046 acres harvested within the No Programmed and No Commercial Harvest buffers prior to buffer designation will regrow to maturity, restoring their value as riparian habitat.

Wetlands

Table 3-34 presents the cumulative acres of projected timber harvest on wetlands within the Project Area. Prior to 1995, 34,465 acres of timberlands were harvested in the Project Area. Of this total, approximately 9,750 acres are wetlands. Alternative 2 represents the unit pool, which is the maximum harvest acreage allowable through year 2004 under current standards and guidelines. Therefore, harvest of wetlands through the reasonably foreseeable future (2004) would be 3,058 acres, bringing the total cumulative acres harvested to 12,808.

In order to project future harvest and road construction on wetlands beyond the reasonably foreseeable, the following assumptions were used: the operable timber base will remain the same as currently identified; standards and guidelines for harvest and road construction activity remain the same; access to timber in relation to wetlands will remain the same; and all suitable timber will have been harvested by 2054. By 2054, approximately 35,611 acres of forested wetlands will have been harvested (Table 3-34).

Table 3-34
Cumulative Acres of Timber Harvest on Wetlands

	Acres of Wetlands			
	1954	**1995**	**2004**	**2054**
Acres Harvested	0	9,750	12,808	35,611
Acres Roads	0	1,315	1,772	2,868
Total Acres Affected	**0**	**11,065**	**14,580**	**38,479**

Source: Ketchikan Area GIS

Timber harvest between 1954 and 1995 resulted in the construction of roads occupying 1,315 acres of wetlands (Table 3-34). By 2004, 1,772 acres, or 2 percent of wetlands, would be occupied by roads, and by 2054, 2,868 acres of wetlands would be occupied by roads. The total area of wetlands affected by harvest and road construction to 2054 would be 38,479 acres. This represents 39 percent of the total wetland area (95,045 acres) for the Project.

Monitoring

A monitoring plan has been developed for the Tongass National Forest by the Forest Planning Team and is described in TLMP Draft Revision (1991a). The Forest Plan contains no specific monitoring goals for floodplains, wetlands, or riparian areas. Monitoring for these resources generally is covered by the soils and water monitoring BMP's.

Project-specific monitoring that is unique to the Lab Bay Project Area, that would not be included in regular Forest Plan or routine implementation monitoring, has been identified for several resources. Project-specific monitoring is not identified for floodplain, wetland, and riparian resources in the Lab Bay Project Area.

Chapter 2 summarizes how project activities relate to Forest Plan and Ketchikan Area monitoring plans, and describes project-specific monitoring opportunities.

Fisheries

Key Terms

Alevin - Newly hatched salmon that are still attached to the yolk sac.

Adfluvial - Fish that ascend or descend from freshwater lakes to breed in streams; includes trout, char and kokanee.

Alluvial Fan Channel - A fan-shaped deposit of sand, gravel, and fine materials made by a stream where it runs out onto a level plain or meets a slower stream.

Anadromous - Fish that ascend from the sea to breed in freshwater streams; includes salmon and trout.

Aquatic Habitat Management Unit (AHMU) - Areas for managing the resources associated with streams and lakes.

Channel Types - The defining of stream sections based on watershed runoff, landform relief, and geology.

Fluvial Process Group - A group of similar stream channel types.

Glide Channel - Channel types that occur on lowlands and landforms, and are mostly associated with bogs, marshes, or lakes.

Large Woody Debris (LWD) - Any large piece of relatively stable woody material having a diameter of at least 10 centimeters and a length greater than one meter that intrudes into a stream channel; also called Large Organic Debris (LOD).

Management Indicator Species (MIS) - A species selected because its welfare is presumed to be an indicator of the welfare of other species sharing similar habitat requirements.

Riparian Management Area (RMA) - The area including water, land and plants that is at least 100 slope feet away from each side of perennial streams, lakes and other bodies of water, as defined in the Stream and Lake Protection LUD.

Salmonid - Refers to the group of fishes to which salmon belong.

Watershed - Area that contributes runoff water to a waterway.

Aquatic resources of the Lab Bay Project Area contribute to the ecology, economy, and lifestyle of the area. Fish support sport fishing, including charter fishing, as well as subsistence and commercial fishing use important to the area economy. Live fish and decomposing carcasses provide important food and nutrients which replenish the aquatic systems and provide other ecological values (Cederholm et al. 1989).

The Lab Bay Project Area contains over 825 miles of streams and nearly 2,500 acres of lakes and ponds, many of which support resident and/or anadromous fish use. Over 4,000 acres of estuary and extensive shoreline marine habitats occur in and around the Project Area. Streams and lakes that support high use fisheries activities are scattered throughout the Project Area. The Red Lake and Salmon Bay Lake stream systems support important commercial sockeye salmon runs.

Timber harvest activities have the potential to affect fish resources by altering fish habitat. Sport angling enthusiasts and subsistence users expressed concern about the potential effects of timber harvest activities on fish habitat, scenic quality and access in several specific areas. Streams and estuaries near the communities of Whale Pass, Port Protection, and Point Baker were identified. Other fisheries of concern included Red Lake, Calder Creek, and Big Creek.

Affected Environment

The Fisheries Resource

Project Area streams contain important anadromous and resident fish habitats. The streams support four species of anadromous salmon (pink, chum, coho, and sockeye, including resident kokanee), as well as cutthroat trout, rainbow/steelhead trout, and Dolly Varden char (Table 3-35). These fish species are the ones of most importance to the commercial, recreational, charter boat/lodge, and subsistence fishery of the region. Additionally, these fish supply a major food resource to black bears, river otters, eagles, and other wildlife. Other nongame species have also been observed in the Project Area streams and waters including sculpin and sticklebacks. There are no reported sightings or known populations of federally listed threatened or endangered fish species in the Project Area.

Salmonid production from streams, lakes, and ponds of the Lab Bay Project Area supports both the local and regional commercial fish industry. Residents from the communities and logging camps of Port Protection, Point Baker, Whale Pass, and Calder Bay are regular users of marine and anadromous finfishes and marine invertebrates. These people seasonally depend upon fish and shellfish stocks that originate from the Project Area. Subsistence users depend upon the fisheries of the area as the primary subsistence food resource (Galginaitis 1993).

Large seasonal concentrations of salmon in the streams and near shore areas also attract local, regional, and out-of-state sport fishing enthusiasts. Charter boat operators, lodge owners, and fishing guides from Whale Pass, Thorne Bay, and Ketchikan are seasonally dependent on these angling opportunities.

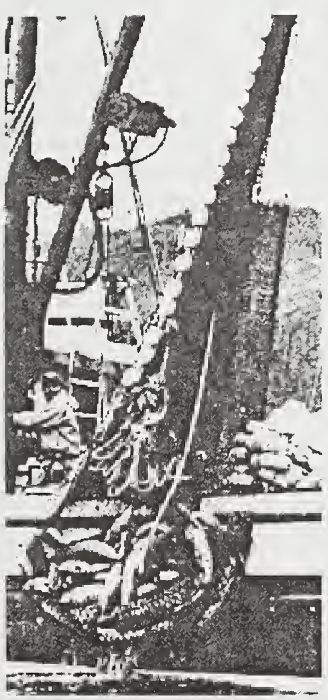
Table 3-35
Fish Species Use of Streams, Lakes, and Estuary Habitats by Lifestage

	Life Stage		
Species	Spawning	Rearing	Overwinter
Pink salmon *(Onchorhynchus gorbuscha)*	X[1]		
Chum salmon *(Onchorhynchus keta)*	X[1]		
Coho salmon *(Onchorhynchus kisutch)*	X	X	X
Sockeye salmon *(Onchorhynchus nerka)*	X	X[2]	X
Cutthroat trout[3] *(Onchorhynchus clarki)*	X	X	X
Rainbow trout[3] *(Onchorhynchus mykiss)*	X	X	X
Dolly Varden char[3] *(Salvelinus malma)*	X	X	X
Sculpin *(Cottus spp.)*	X	X	X
Stickleback	X	X	X

1 Pink and chum salmon utilize the estuary/freshwater zone after emergence

2 Sockeye salmon rear in lakes for 1 to 2 years

3 Rainbow trout, cutthroat trout and Dolly Varden char can exhibit either anadromous or resident life history patterns



Purse seiner hauling a load of salmon. Fish resources of the Lab Bay Project Area are important to residents of the local communities.

Fish Habitat Requirements

Anadromous fish spend at least part of their life in freshwater and part in saltwater. Salmon lay their eggs in stream gravels, and the juvenile fish hatched from the eggs emerge from the gravels. Pink salmon start their downstream migration immediately after emergence, while coho salmon juveniles generally spend two years in freshwater before migrating to the ocean. Sockeye require a freshwater lake environment for 1-2 years before migrating to the ocean. Pink and chum salmon are especially dependent on estuaries during their early life stages. Salmon reach maturity in the ocean, only to return to their natal streams to spawn and die and start the cycle again. Steelhead trout follow a cycle similar to coho salmon, except they often survive the spawning season, return to the ocean, and spawn again.

Resident trout, char, and kokanee spend all of their lives in freshwater, spawning in stream gravels and growing to maturity in the streams and lakes of the area.

Estuaries, which are also present in the Project Area, are important aquatic resource regions. Estuaries are unique systems because they form transitions between terrestrial, freshwater, and marine environments. Estuaries are rich and diverse, harboring many resident species and providing food, spawning areas, or shelter for numerous other species including anadromous salmon and trout at critical points in their life cycle. In the Lab Bay Project Area, crab, shrimp, clams, mussels, and various marine fishes are associated with the estuaries and surrounding waters which form a nursery for their young. Herring and smelt also use these areas for spawning and feeding.

Project Area Watersheds and Stream Networks

A total of 46 third or fourth order watersheds were identified in the Project Area following Strahler (1957). Division of the area into watersheds facilitates the evaluation of management activities on stream and lake resources and assessment of both project specific and cumulative effects.

Third order and larger watersheds range from 450 acres to 8,210 acres. A number of smaller watersheds also contribute greatly to fish production. Many of these contain streams that are unnamed, and for management purposes are referred to by the Alaska Department of Fish and Game Anadromous Stream Catalog number. Not all fish-bearing streams are included in the ADF&G catalog.

Of a total of 825 miles of stream mapped in the Lab Bay Project Area, approximately 293 miles of stream are known or suspected to be inhabited by fish (Table 3-36; Figure 3-9). The largest stream systems include Buster, Big, Alder/Flicker, Red, El Capitan, Calder, 108, and Marble Creeks, and the Salmon Bay River. Red Lake, Salmon Bay Lake, and Cavern Lake are freshwater lakes that support both resident and anadromous fish. These three lakes support the majority of the sockeye salmon production within the Project Area.

Estuary habitats are found at the mouths of large streams and comprise approximately 4,036 acres. Estuarine areas associated with Salmon Bay, Calder Bay, Red Bay, Whale Pass, and Port Protection are among the largest in the Project Area. The latter three areas are easily accessed and commonly used by sport and subsistence fishermen.

STREAM CLASSES

Class I Streams
Provide high quality habitat for anadromous and sport fishes.

Class II Streams
Provide habitat for resident fishes, but have limited sport fishing value.

Class III Streams
Have potential influence on water quality of downstream aquatic habitat.

Stream Classes

Three stream class designations are identified for the Tongass National Forest according to the Aquatic Management Habitat Handbook (FSH 2609.24). Stream classes are determined primarily by known or potential presence of fish. Table 3-36 provides the miles of stream by stream class for the Project Area.

Class I

Class I streams contain anadromous or adfluvial lake and stream fish habitat. The habitat upstream from migration barriers known to be of a reasonable enhancement opportunities for anadromous fish, and habitat with high value resident sport fish populations also are categorized as Class I. Over 262 miles of Class I streams are present in the Project Area.

Figure 3-9
Project Area Streams

Source: Ketchikan Area GIS

Class II

Class II streams support resident fish populations. These streams generally occur upstream of migration barriers or are steep gradient streams with other habitat features that preclude anadromous fish use. Approximately 31 miles of Class II streams are present in the Project Area.

Class III

These streams do not support fish populations but have potential water quality influences on downstream aquatic habitat. Approximately 532 miles of Class III streams are present in the Project Area.

Stream and Channel Classification

Channel Types and Fluvial Process Groups

Differences in flow regime and geomorphic characteristics of drainage basins lead to significant natural variation in fish habitat characteristics in the Lab Bay Project Area. The wide variety of stream conditions encountered makes it impractical to develop streamside and basin wide management guidelines that would be applicable to all watersheds. For this reason, the Tongass National Forest uses a channel typing system (Channel Type User Guide, Tongass National Forest Southeast Alaska, USDA Forest Service 1992b) as an inventory and planning tool.

Channel types formed and maintained by similar processes are grouped into fluvial process groups. Channel types are defined by physical characteristics of the channel and landforms through which they flow. All classified streams in the Project Area also have been assigned channel type and fluvial process group designations (Table 3-36).

Following is an abbreviated discussion from the Channel Type User Guide (Forest Service 1992b) of stream habitat suitability and sensitivity of the nine fluvial process groups. Included are channel characteristic descriptions that identify the vulnerability of fish habitat specific to the Lab Bay watersheds.

Estuarine Process Group

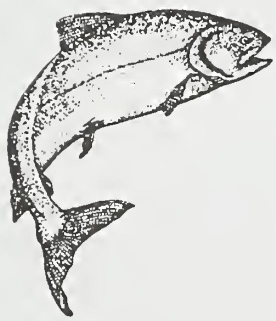
Estuarine Process Group channels are intertidal streams that are frequently inundated by saltwater. They occur at the mouths of major watersheds within estuarine landforms. Estuarine channels typically are associated with estuary marshes, meadows, mudflats, and gravel deltas. Woody debris in estuarine channels generally originates from upstream sources. The mouths of Salmon Bay River, Red, Calder, and 108 Creeks are examples of estuarine process group channels.

Table 3-36
Miles of Streams by Channel Process Group and Stream Class*

Process Group	Class I	Class II	Class III
Estuarine	20.3	0.0	0.0
Palustrine	27.2	8.0	0.0
Floodplain	46.4	0.0	0.0
Alluvial Fan	6.1	5.1	1.1
Large Contained	16.1	0.0	0.0
Moderate Gradient Mixed Control	56.9	2.5	4.3
Moderate Gradient, Contained	88.0	12.2	9.1
High Gradient, Contained	1.3	3.3	522.9
All Streams	262.3	31.1	532.0
Total Stream Miles		**825.4**	

Source: Ketchikan Area GIS

* An additional 25 miles of "stream channel" flows through approximately 2,400 acres of lakes and ponds of the Project Area.



Palustrine Process Group
Channels of the Palustrine Process Group occur throughout the Project Area and are normally very low gradient, associated with low relief landforms and wetland complexes. Beaver ponds and backwater sloughs are common. Sediment transport is low, as these channels serve as fine sediment traps. Most channels of the Palustrine Process Group within the Lab Bay Project Area are small, less than 10 feet in width (except in beaver impoundments). They are often bordered by nonforested wetland communities and muskegs, resulting in expansive riparian areas. Numerous Palustrine channels occur in the northwest and northeast portion of the Project Area along the coastal plain, including Baker and Humpy Creeks.

Floodplain Process Group
Streams of the Floodplain Process Group include uplifted estuary and floodplain channel types. As the name implies, flooding is an important process, serving to dissipate stream energy delivered from upper watersheds during storm events. Riparian zones are typically very broad, extending well beyond 200 foot slope distance from the stream edge in some streams (lower Buster Creek and lower Salmon Bay River, for example).

All Floodplain Process channels on the Lab Bay Project Area are accessible to anadromous fish. These channels provide abundant spawning, rearing, and overwinter habitat. Woody debris and off-channel rearing areas are critical habitat components. Small spring fed channels and beaver ponds were found within many of these process groups. These channels offer excellent sport fish opportunities, as exemplified from the angling pressure observed in easily accessed reaches of 108, Red, and Big Creeks.

Alluvial Fan
Alluvial Fan channel types are typically comprised of dynamic and often unstable channels. These are low to moderate gradient streams, ranging from 3 percent to over 15 percent, depending on inherent sideslopes from which the channel originates. Fish use and habitat potential are marginal and normally limited to the lower reaches.

Large Contained Process Group
Large Contained Process Group channels include low to moderate gradient large channels situated in lowlands to mid-sections of watersheds. These are typically moderately incised into adjacent

landforms, creating a well contained channel. Channel gradients typically range from 2 percent to 5 percent. Channel sinuosity is low due to the constrained nature of the stream.

Stream reaches that typify this process group are located on Flicker Creek, 108 Creek, and Buster Creek. Inclusions of the moderate gradient mixed control and moderate gradient process group channels occur frequently within these stream reaches. All of the Large Contained channels in the Project Area are accessible to anadromous fish. All anadromous fishes access the lower reaches, but it is not uncommon for barriers to preclude upstream movement of the pink and chum salmon.

Moderate Gradient, Mixed Control Process Groups

Streams of the Moderate Gradient, Mixed Control Process Groups are typified by moderate gradient (2 percent to 6 percent) channels with banks dominated by boulders or infrequent bedrock outcrops. Nearly 90 percent of the Moderate Mixed channels are accessible to anadromous species.

Where they occur in the Project Area, it appears that these short reaches of sediment and wood deposition provide a major role in gravel retention and development of rearing and overwinter habitats. These channels are generally accessible to anadromous fish species. Downstream barriers account for most cases where access is restricted. Coho, steelhead, Dolly Varden, and resident cutthroat trout are most common inhabitants. Overwintering habitat is limited, compared to floodplain channels, and is confined primarily to boulder interstices and infrequent reaches of woody debris accumulations.

Moderate Gradient, Contained Process Groups

Streams of the Moderate Gradient, Contained Process Groups are typified by relatively narrow and shallow to deeply incised channels. Stream flow is completely contained within competent adjacent landforms and channel banks. Bedrock outcrops are common. Sediment is quickly transported through Moderate Contained channels. Consequently, gravel bars and deposition areas are uncommon; bank stability is high. High water velocities, difficult passage conditions, and frequent bedrock and cascade areas often result in low to moderate value to anadromous fishes. However, nearly 80 percent of the Moderate Contained stream miles in the area are known or suspected to be inhabited by anadromous or adfluvial stocks. Streams in this process group may serve as travel corridors to habitats more favorable to fish.

Prime examples of Moderate Contained channels include segments in the mid-elevation reaches of Calder Creek and Shine Creek. Much of the woody debris in the Moderate Contained Process group channels are found associated with small slope failures and windthrow along steep sideslopes. Woody debris lodged in constrictions traps gravel and sediment. Maintenance of woody debris recruitment sources is important for both habitat formation and sediment storage functions.

High Gradient Contained Process Group

High Gradient Contained Process Group channels are shallow to deeply incised into valley sideslopes and headwater basins. These channels serve as source streams for downstream fish bearing channels by transporting organic and inorganic sediments. Typically, these streams are high to very high gradients (over 6 percent and usually over 15 percent) and are associated with high stream energies, especially in spring melt or periods of large storm events. Channel types of this group are sediment source zones. Fish use and habitat potential are marginal and normally limited to the lower reaches.

High gradient process group channels represent over 522 miles, or 63 percent of the stream network in the Project Area. Landslides events contribute substantial sediment and woody debris loads when channels are associated with hillslopes sensitive to high to very high mass failure potential. Examples include headwater tributaries to the east fork of Red Creek and the upper Salmon Lake tributaries.

Riparian Management Areas

The Aquatic Habitat Management Handbook (FSH 2609.24) specifics the use of stream class in combination with channel type to define Aquatic Habitat Management Units (AHMU). These areas are defined for management of resources associated with streams and lakes and incorporate concerns for fish habitat, forest type, geology, soils, and water quality. The TLMP Draft Revision (1991a) proposes the Stream and Lake Protection Land Use Designation, which incorporates and supplements the intent of the AHMU system. This system was adopted for planning of the Lab Bay Sale.

Under the Stream and Lake Protection LUD, administrative 'riparian management areas' (RMA's) are defined based on stream channel type and adjacent soils. Riparian management areas include perennial streams, bodies of water with actively flowing fresh water, bodies of fresh water inhabited by fish, and estuaries, along with the lands adjacent to these aquatic habitats. The adjacent lands are those dominated by riparian vegetation and nearby nonriparian lands with potential to influence water quality. A minimum of 100 feet (horizontal distance) on each side of the waterbody is included within the riparian management area.

The riparian management area is comprised of four primary components, each with different management requirements.

1. No Commercial Harvest Buffer: A minimum 100-foot buffer is applied to each side of all Class I streams and Class II streams that flow directly into Class I streams, as specified in the Tongass Timber Reform Act (1990). No commercial harvest is allowed within the buffer, although limited clearing for road building is permitted.

2. No Programmed Harvest Buffer: This buffer is applied primarily to alluvial fan, floodplain, and estuary channel types, and is in addition to the no commercial harvest buffer, if the latter is present. Programmed harvest activities are precluded within this buffer, but salvage and individual tree cutting may occur.

3. Selective Harvest Buffer: A selective harvest buffer is designated on several channel types, including lakes greater than 50 acres in size. Within this buffer, selective harvest of trees is allowable in accordance with specific direction provided in the Stream and Lake Protection LUD. The selective harvest buffer is in addition to any no commercial or no programmed harvest buffers present on a stream reach.

4. Planning Level Zone: All channel types not receiving at least one of the first three buffer components receives a planning level zone of a minimum 100 feet. The area within this zone is available for harvest while meeting riparian area management objectives for fish habitat and water quality, as specified in the Stream and Lake Protection LUD.

Each of the four RMA components is extended to include adjacent riparian or very high mass movement soils. Appendix L provides the specific channel widths and RMA component widths for channel types on the Tongass National Forest.

Within the Lab Bay Project Area, 28,763 acres are located within riparian management areas. Table 3-37 indicates the acres within each of the four RMA components, by VCU.

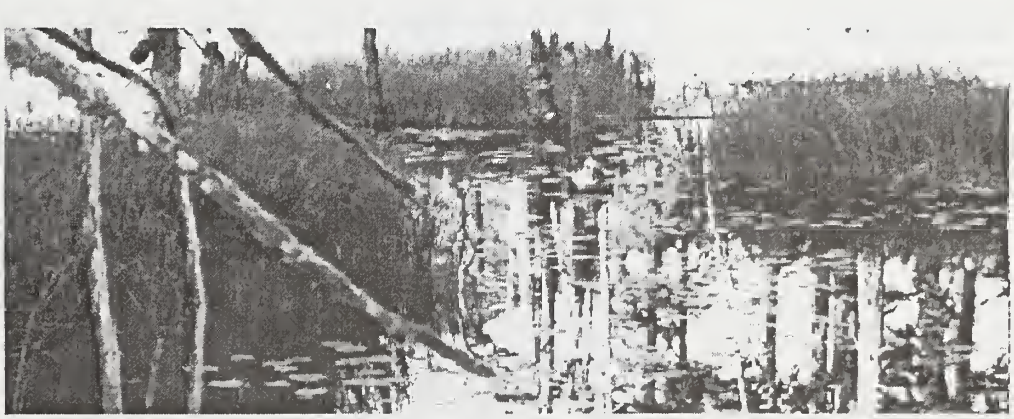


Table 3-37
Summary of Acres Within Stream and Lake Protection LUD RMA's*

VCU	No Commercial Harvest Buffer	No Programmed Harvest Buffer	Selective Harvest Buffer	Planning Level Zone	Total RMA
527.0	188	17	172	875	1,252
528.0	92	9	21	556	677
528.1	99	40	12	430	582
529.0	864	136	164	1,413	2,577
530.0	623	83	112	1,016	1,834
531.1	585	110	360	1,217	2,271
531.3	106	10	36	112	265
532.0	812	95	317	898	2,121
533.0	585	42	407	1,185	2,219
534.0	551	7	80	766	1,404
534.1	166	47	94	47	353
534.2	869	42	561	347	1,819
534.3	346	51	183	40	620
534.4	51	0	20	292	363
535.0	306	94	114	733	1,247
536.0	239	61	227	880	1,407
537.1	215	17	165	849	1,246
538.0	432	157	418	1,102	2,108
539.0	409	76	247	1,084	1,816
540.0	372	27	253	542	1,193
551.0	284	39	370	696	1,389
Total	**8,193**	**1,159**	**4,332**	**15,078**	**28,763**

Source: Ketchikan Area GIS

* RMA acreage presented in this table includes state, private and encumbered lands.

Management Indicator Species

The National Forest Management Act requires that Management Indicator Species (MIS) be identified for each National Forest and be used to address the effects of timber harvest activities. This planning effort focused on three MIS that collectively represent the association between habitat requirements and management concerns. The three MIS selected for the Tongass National Forest include pink salmon, to represent anadromous fish whose populations are generally limited by spawning habitat availability; coho salmon, to represent both anadromous and resident fish whose populations are generally limited by rearing habitat; and Dolly Varden char, to represent habitat requirements of resident trout. The MIS fish populations are believed to indicate the effects of land management in the National Forest Systems land in the Lab Bay Project (TLMP Draft Revision 1991a).

Fish Habitat Capability

Habitat capability is defined here to represent the carrying capacity of streams of the Project Area: the maximum number of fish the habitat can produce. This is not the equivalent of standing crop or population size, which is the actual number of fish using the habitat at a given time. Populations tend to fluctuate due to a wide range of factors, including fish harvest, oceanic conditions, weather, and competition. Stream habitat capabilities remain relatively constant given no large-scale natural or human caused perturbations. Habitat capability is measured in number of smolts for anadromous fish (the life stage of anadromous fish that migrate from freshwater to saltwater) and in number of fish for resident fish.

Populations of fish in Southeast Alaska have been shown to fluctuate greatly, as demonstrated by commercial salmon harvest statistics and escapement counts. At this time, there is no evidence of direct correlation between freshwater habitat conditions and overall commercial catch of salmonids. Nevertheless, in isolated watersheds throughout Southeast Alaska, British Columbia, Washington, and Oregon, there is evidence that management disturbance is one of the reasons for declines in populations. Research documents that reduction of woody debris, increased sediment, and temperature increases can affect habitat capabilities (Robison and Beschta 1990, Marcus et al. 1990, Holtby and Scrivener 1989). For this reason, the Tongass National Forest uses habitat capability models to provide indices of fish population status.

Capability Models

Capability models used on the Tongass National Forest depend on the channel type/stream class inventory and RMA status as the basic components. The models assume a relationship between fish habitat production potential and stream physical characteristics. Stream gradient, large woody debris, substrate characteristics, and position in the drainage network are all factors that affect habitat capabilities.

The capability model for pink salmon is based on the availability of spawning gravels. Pink salmon emerge from the stream gravels in the spring and immediately migrate to saltwater. The coho salmon model is based on availability of habitat components that provide overwinter survival. Overwintering habitat is considered the critical factor for species that reside in streams for more than one year. Habitat capability for Dolly Varden is limited by the quantity and quality of spawning gravel and the availability of lakes and relatively deep pools that support overwintering.

Model outputs are formulated by using assumptions concerning the capability of a given channel type/stream class to produce fish under pristine, old growth conditions. While these estimates may not be statistically valid for all stream systems throughout Southeast Alaska, model values are useful in providing an index of condition and change.

Model details are provided in the TLMP Draft Revision, Appendix B (1991a).

Table 3-38 lists the habitat capability predicted for the three salmonid management indicator species by VCU, as modeled for the natural habitat capability, prior to the large-scale timber harvest initiated in 1954 in the Project Area.

Table 3-38
Natural Habitat Capability for Fish MIS Prior to Timber Harvest

VCU	Pink Salmon (Number Smolts)	Coho Salmon (Number Smolts)	Dolly Varden (Number Fish)
527.0	506,534	5,841	17,585
528.0	255,413	8,719	21,701
528.1	881,985	7,399	16,490
529.0	4,780,914	38,002	89,522
530.0	2,996	27,799	75,859
531.0	5,186,608	42	328
531.1	312,642	11,917	44,444
531.2	174,567	2,846	18,617
531.3	3,110,841	993	5,052
532.0	3,110,841	28,041	66,327
533.0	2,723,938	28,350	101,164
534.0	562,208	3,495	20,037
534.1	157,352	1,146	6,094
534.2	2,990,479	228,608	159,176
534.3	1,047,468	2,984	8,925
534.4	45,986	312	6,571
535.0	1,578,953	18,659	46,897
536.0	706,829	11,957	39,535
537.1	264,948	2,653	21,396
538.0	1,166,536	10,649	60,036
539.0	1,673,536	19,121	49,712
540.0	226,196	12,020	42,381
551.0	961,205	7,374	2,845
Total	**32,428,975**	**478,927**	**920,694**

Source: Kessler 1993

Descriptions of how these models are used to address the effects of past management practices and track improvement of stream systems through time are provided in the TLMP Draft Revision (1991a).

Effects of the Alternatives

Fish Habitat Protection Standards

Timber harvest and associated road building can affect fish resources by changing the delivery of water, sediment, and large woody debris to the stream system. Changes to the input and transport of these components can adversely affect fish habitat. Removal of streamside vegetation can also increase the seasonal range of water temperatures through loss of stream shading. The risk of timber harvesting or road building detrimentally affecting fish habitat is greater the closer the activity is to a stream. For this reason, riparian management areas that limit removal of vegetation near streams were established.

The National Forest Management Act (NFMA) sets the minimum standard for fish habitat protection on all national forests. The Tongass Timber Reform Act (TTRA) further provides specific direction for fish and riparian protection for the Tongass National Forest.

The NFMA requires that no serious and adverse effect occurs to fish habitat; NFMA (36 CFR 219.27 (e)) states, in part:

> " No management practices causing detrimental changes in water temperature or chemical composition, blockages of water courses, or deposits of sediment shall be permitted within these areas [riparian areas] which seriously and adversely affect water conditions or fish habitat."

In addition, the current TLMP (1979a, as amended) has as a goal to:

> "...maintain and enhance the natural fisheries resources by managing some of the highest quality watersheds in ways which would not modify them significantly. In those where major management activities will take place, adequate protection of the aquatic environment will be provided."

The TTRA provides direction for fisheries protection in section 103(a). The objective of this section of TTRA is to assure the protection of riparian habitats and to protect fisheries through the application of buffer zones not less than 100 feet in width and through the application of Best Management Practices (BMP's). The Act reads:

> "(a) Section 705 (16 U.S.C. 539d) of ANILCA is amended by adding at the end thereof the following new subsection: "(e) In order to assure protection of riparian habitat, the Secretary shall maintain a buffer zone of no less than one hundred feet in width on each side of all Class I streams in the Tongass National Forest, and on those Class II streams which flow directly into a Class I stream, within which commercial timber harvesting shall be prohibited... For the purposes of this subsection, the terms 'Class I streams' and Class II streams' means the same as they do in the Region 10 Aquatic Habitat Management Handbook (FSH 2609.24), June 1986."

The Lab Bay Sale was designed to comply with the standards and guidelines for fisheries protection in the TLMP (1979, as amended) and the TLMP Draft Revision (1991a). The recently published 1996 TLMP Draft Revision provides updated standards and guidelines for protection of riparian, water quality, and fisheries resources. The Lab Bay unit design, proposed mitigation, and analysis of effects is consistent with the updated standards and guidelines. Watersheds proposed for harvest under the Lab Bay sale were reviewed to determine the extent of past harvest and road building; extent of high and very high MMI soils; riparian resources; and fisheries concerns including passage, temperature sensitivity, and access. The level of harvest proposed and specific unit prescriptions take into account existing watershed conditions as well as site-specific conditions within and adjacent to the units. The analysis and sale design is consistent with the watershed analysis approach proposed in the 1996 TLMP Draft Revision.

The Lab Bay harvest units and roads were field-verified by resource specialists who recommended mitigation measures as appropriate to each site, including extended no-harvest buffers along floodplains, muskegs, and forested habitats; selective harvest or individual tree selection; and suspension requirements along Class III streams and V-noteches as needed to protect downstream water quality and fisheries resources. These mitigation measures go beyond the minimum requirements

of the Forest Plan, and offer an increased level of protection as recommended for riparian areas under the Preferred Alternative of the 1996 TLMP Draft Revision.

Direct and Indirect Effects

Timber harvest includes a range of activities, including roading, timber falling, bucking, and yarding. Each of these activities can have specific physical impacts to streams and riparian zones which may affect the capability of stream habitat to produce fish.

To display the potential direct and indirect effects to fish habitat, the extent and distribution of proposed harvest and roads adjacent to streams is presented. How these changes affect aquatic systems and riparian areas are discussed in terms of their alterations of key attributes: large woody debris, temperature, sediment, and angler access. The potential effects to the three Project Area MIS are identified through the use of habitat capability models. How project activities combine with past management and future planned actions is addressed under the Cumulative Effects section.

Harvest in Riparian Management Areas

Harvest of streamside vegetation may directly influence fish habitat by removal of sources of large woody debris and stream shading. In addition, this activity may affect other riparian resources, especially wildlife species dependent on riparian and aquatic resources for reproduction, foraging, or dispersal.

Large woody debris (LWD), consisting of trees and tree pieces that have fallen into a stream, is a key component of high quality salmonid habitat. This material provides cover for juvenile and adult fish, and is the primary channel-forming element in some channel types (Heifetz et al. 1986). As debris accumulates in streams, it creates pools, traps sediment and nutrient-laden organic matter, and supports aquatic insects and other food items for fish. Gradual and consistent input of LWD is important to maintain stream productivity (Harris 1989).

Past management practices have reduced the amount of large in-channel woody material in some streams on the Project Area. Prior to the enactment of TTRA, timber commonly was harvested to the edge of the streams, and stream cleaning operations removed wood from streams to prevent perceived fish passage problems.

Harvest of streamside vegetation, as well as the total amount of harvest in a watershed, can affect water temperature and flow regimes. Water temperature affects dissolved oxygen levels in streams and the metabolic rate of aquatic organisms, and can affect the migration timing of adult and juvenile fish. Small changes in water temperature can affect fry emergence subsequently effecting adult survival (Holtby and Scrivener 1989). Shading of streams is important because direct solar radiation is the primary factor influencing temperature change in summer. The effect of canopy removal is directly proportional to the reduction in stream shading.

The TLMP Draft Revision (1991a) would limit commercial harvest to less than 35 percent of a third or fourth order watershed within a 15-year period (see Water Resources section). This allows for recovery of the watershed and a reduction of stream temperature sensitivity before additional harvest may take place within the watershed. In addition, a cumulative harvest threshold of 25 percent of the RMA is established for stream channels in the High Gradient Contained Process group (see Cumulative Effects).

Harvest of upland timber stands can increase windthrow in the adjacent, unharvested riparian buffer zones. Windthrow of large portions of retained riparian stands can negate the original purpose of buffer strips. Buffer strips in areas vulnerable to windthrow can be designed a number of different ways to reduce the potential for windthrow. Methods include feathering of buffer strip edges, increased buffer width to key into topographic breaks, and diameter-limited cuts along harvest unit boundaries. Measures designed to enhance buffer strip longevity are prescribed on the Unit Design Cards (Planning Record).

Table 3-39 presents the acres to be harvested within the RMA components under each alternative.

Table 3-39
Acres of Timber Harvest Within RMA's

RMA Component	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
No Commercial Harvest Buffer	0	0	0	0	0
No Programmed Harvest Buffer	0	0	0	0	0
Selective Harvest Buffer	65	47	25	58	15
Planning Level Zone	326	212	239	200	126
Total All Components	**391**	**259**	**264**	**258**	**141**

Source: Ketchikan Area GIS

No Commercial, No Programmed, and Selective Harvest buffers will ensure maintenance of functional riparian values through time. These riparian areas will continue to serve as contributors to in-channel large woody debris, bank stabilization, and sediment regulation.

In addition, mitigation measures were designed for each unit to protect specific tributary streams. Appropriate felling and yarding strategies are identified for all tributary steams adjacent to or within units. These prescriptions include maintenance of variable width partial or no harvest buffers, directional felling, split yarding, and suspension requirements. These measures are summarized in Chapter 2 - Mitigation Measures, and are identified on Unit Design Cards provided in the Planning Record.

Roads

Road construction and use often pose the greatest potential risk to riparian resources and fish habitat capabilities. Roads can affect fish habitat through the introduction of fine sediments, increase in landslides due to road location and design, and re-routing of sediment laden water.

Significant concern was identified during public scoping for the increased recreational access associated with road development and maintenance. Although easier access can be viewed as a benefit for angling opportunities, increased fishing pressure could result in potential overharvest of wild stocks of fish unless carefully regulated by ADF&G.

Distribution of Proposed Roads

Table 3-40 shows the miles of roads to be constructed within RMA components under each alternative.

Table 3-40
Miles of New Roads Within RMA Components

			Miles		
RMA Component	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
No Commercial Harvest Buffer	1.5	0.5	1.0	0.8	0.3
No Programmed Harvest Buffer	0.1	0.1	0.0	0.1	0.1
Selective Harvest Buffer	2.6	1.7	0.6	1.7	0.4
Planning Level Zone	6.6	4.7	4.0	4.2	2.1
Total All Components	**10.8**	**7.0**	**5.6**	**6.8**	**2.8**

Where practicable, roads were located to minimize distances within RMA's, particularly along Class I and II streams.

Stream Crossings

Road construction will require numerous stream crossings to access proposed timber harvest units planned under each alternative. Nineteen crossings are associated with Class I streams and 15 with Class II streams under Alternative 2, the full unit pool (Table 3-41). Implementation of Alternative 5 would require 12 crossings of Class I streams and 14 crossings of Class II streams. Alternative 6 would require the fewest new or reconstructed crossings of Class I and II streams, 6 and 4 respectively. Since adult or juvenile salmonids are found in all watersheds of the Project Area, their free passage and migration should be assured. Road construction and reconstruction and associated stream crossings would be highest in the Calder, Big, and Buster Creek watersheds. Most crossings would be associated with Class III tributaries.

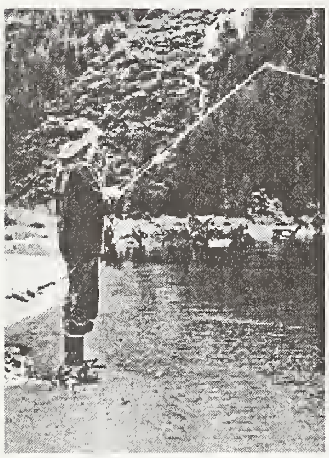
Best Management Practices (BMP's) were assigned to all stream crossings in accordance with FSH 2509.22. Crossings on Class I streams and streams located in close proximity to Class I streams were designated for construction timing restrictions (Table 3-41 and Logging and Transportation section of this EIS). Road construction activities in Class I streams are allowed only when eggs or alevin are not in the stream gravels. The allowed windows for instream work generally occur prior to adult salmon entry into stream systems to avoid disturbance during spawning. In the Ketchikan Administrative Area, the windows for allowed instream operations are conservatively established to be June 1 to August 7 for pink and chum salmon, June 15 to August 15 for sockeye, June 15 to September 1 for coho salmon, and July 18 through August 15 for steelhead trout. However, because of the variability of fish presence, abundance, and timing by system, the exact dates of allowable construction may vary from those presented for individual stream crossings. Site-specific fisheries and field information (including ADF&G recommendations) are used to determine the operating windows and would be used to determine final construction windows.

Table 3-41
Number of Streams Crossed by New and Reconstructed Roads*

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Class I	0	19 (19)	7 (7)	11 (11)	12 (12)	6 (6)
Class II	0	15 (7)	13 (5)	5 (5)	14 (6)	4 (3)
Class III	0	123 (2)	82 (0)	71 (1)	84 (2)	42 (0)
Total	**0**	**157**	**102**	**87**	**110**	**52**

Source: Ketchikan Area GIS

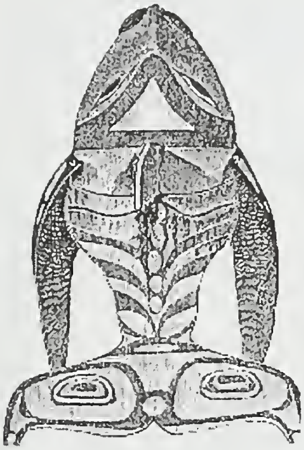
* Numbers in parentheses indicate crossings for which timing restrictions are required or recommended.



Sediment Delivery From Roads

A detailed discussion of the effects of road construction and sediment delivery to streams is presented in the Water Resources section of this EIS. Run-off of sediment-laden water from upland roads can produce adverse effects to fish spawning and rearing habitat. These effects can be minimized by proper sizing and location of roads and culverts, end hauling excavated materials on steepened slopes, and the presence of an adequate buffer between roads and fish bearing streams. Best Management Practices (FSH 2509.22) are assigned (See Unit and Road Cards in the Planning Record) for protection of fisheries habitat.

There remains a risk to water quality and fish habitat due to unforeseen events, such as road failures, breakdown of construction materials, and failure of stream crossing structures to pass fish. The risk of these events increases with the number of roads within a watershed, and more specifically, the number of harvest units identified as difficult or isolated for logging. Most notable of these include the west side of Buster Creek, upper Salmon Bay, upper Red Lake, and



Top view of Haida killer-whale mask.

upper Calder Creek. To minimize the risk of adverse consequences, proposed harvest units in these areas would be accessed by field verified ridge top roads as identified on unit cards. In some cases, such as upper Calder and Red Lake, harvest would be conducted by helicopter, thus alleviating the need for extensive road systems crossing over difficult terrain.

Angler Access

Demand and competition for fisheries resources is expected to increase as access is improved and more people enter the area. Parts of the Project Area are popular recreational and subsistence fishing areas. Presently, the majority of freshwater and nearshore angling occurs at the mouths of large stream systems. As road access increases, the number of people with direct access to the fisheries resource could increase the harvest of freshwater species, especially in mid-elevation portions of the watersheds. New road access would allow sport fishing in more remote stream and lakes.

Although steelhead stocks are not considered at risk of expiration on Prince of Wales Island, their numbers are low and concern for management of the species is warranted. Catch information in 1992 and 1993 led to emergency adoption of more stringent regulations by the Alaska Department of Game on specific steelhead streams on Prince of Wales Island.

Increased access to the Project Area would occur as new roads are constructed for the Lab Bay sale; however, this effect would be temporary, extending for the duration of the sale. A Road Access Management Plan has been developed for the Lab Bay Project Area (See Logging and Transportation Section). This plan, to be implemented under each of the action alternatives, would result in a net reduction of miles of open road in the area. The plan calls for closure of all but three miles of road constructed for the Lab Bay sale and proposes closure of 54 miles of existing roads. Thus, motorized access within the Project Area would be reduced from current levels. Pedestrian use of closed roads would be possible.

Cumulative Effects

Forest-wide standards and guidelines limit harvest to no more than 35 percent of the area of each third order or larger watersheds within a 15-year period. Cumulative harvest in third and fourth order watersheds to the year 2004 is discussed in the Water Resources Section of the EIS.

In addition, management prescriptions for the Stream and Lake Protection LUD include a guideline for maximum harvest rate within the RMA along streams of the High Gradient Contained Process Group (HGC). Harvest rate is not to exceed 25 percent of the acres every 20 years within the RMA (which consists of a planning level zone) of a third order or larger watershed.

Timber harvest has occurred within the HGC planning level zone of 36 of the major watersheds over the past 20 years. Ten of the watersheds currently exhibit percent harvest values that exceed the guideline threshold value of 25 percent. These watersheds include: A22A (Baker), A19B (Flicker), A12A (Duck), A15A (Strait), A05A (Pine), A55A (northwest of Neck Lake), and four small watersheds (less than 500 acres each, Table 3-42).

Timber harvest proposed under the action alternatives was evaluated for its effects on cumulative harvest of HGC stream RMA's, in accordance with the Stream and Lake Protection LUD guidelines. Table 3-42 provides the results of this analysis.

No additional timber harvest is proposed under the alternatives for nine of the ten watersheds currently exceeding the HGC harvest threshold of 25 percent. Watershed A22A (Baker Creek) would receive additional harvest under Alternatives 2, 3, and 5.

Baker Creek (A22A) cumulative HGC harvest values would increase from 34 percent to 41 percent under Alternatives 2 and 5. Although the percentage increase appears large, it results from proposed harvest of only 6 acres, located in two units partially within the watershed. The total watershed area is 1,000 acres, with 88 acres located within HGC RMA's. Under Alternative 3, harvest of less than an acre would not significantly increase the cumulative harvest percentage. No harvest is proposed for the watershed under Alternative 4.

Three watersheds that are currently below the 25 percent threshold would be increased above 25 percent by harvest proposed under alternatives: Big Creek (A30B & A31C), AK4A, and B30A.

Table 3-42

Acres and Percent of High Gradient Contained Process Group RMA Harvest

Watershed[1]	Acres HGC RMA[2]	Acres[3] Past Harvest 20 Yrs	Percent[3] Past Harvest 20 Yrs	Acres Alt. 2 Harv.	Cum. % Harv.	Acres Alt. 3 Harv.	Cum. % Harv.	Acres Alt. 4 Harv.	Cum. % Harv.	Acres Alt. 5 Harv.	Cum. % Harv.	Acres Alt. 6 Harv.	Cum. % Harv.
A05A	122.4	34.0	28[4]	0.0	--	0.0	--	0.0	-	0.0	--	0.0	--
A09A	86.0	73.0	85[4]	0.0	--	0.0	--	0.0	--	0.0	--	0.0	--
A10A	60.3	45.6	76[4]	0.0	--	0.0	--	0.0	-	0.0	--	0.0	--
A12A	134.5	52.8	39[4]	0.0	--	0.0	--	0.0	--	0.0	--	0.0	--
A15A	64.5	24.0	37[4]	0.0	--	0.0	--	0.0	--	0.0	--	0.0	--
A19B	546.3	170.7	31[4]	0.0	--	0.0	--	0.0	--	0.0	--	0.0	--
A21A	38.6	33.4	86[4]	0.0	--	0.0	--	0.0	--	0.0	--	0.0	--
A22A	88.4	30.0	34[4]	6.4	41[5]	0.1	34[5]	0.0	--	6.3	41[5]	0.0	--
A30B+A31C	491.5	87.7	18	53.6	29[6]	53.6	29[6]	7.5	19	53.6	29[6]	7.5	19
A44A	70.1	41.3	59[4]	0.0	--	0.0	--	0.0	--	0.0	--	0.0	--
A55A	75.1	37.8	50[4]	0.0	--	0.0	--	0.0	--	0.0	--	0.0	--
AK4A	29.0	3.1	11	10.1	45[6]	0.0	--	10.1	45[6]	10.1	45[6]	0.0	--
B30A	7.5	0.0	0	4.1	55[6]	4.1	55[6]	1.7	23	4.1	55[6]	1.7	23

1 Includes third and fourth order watersheds only
2 Includes acres within planning level zone on streams of High Gradient Contained Process Group
3 Includes acres harvested after 1974
4 Existing condition harvest exceeds 25 percent threshold
5 Existing condition harvest exceeds 25 percent threshold; harvest under the alternative increases percentage
6 Harvest under the alternative exceeds 25 percent threshold

The Big Creek watershed is comprised of two large third-order watersheds, A30B and A31C, totaling 5,899 acres. Approximately 491 acres are located within HGC RMA's. Proposed harvest of 54 acres under Alternatives 2, 3, and 5 increases the cumulative HGC harvest from 18 to 29 percent. Under Alternatives 4 and 6, harvest of 7.5 acres would increase the cumulative harvest from 18 to 19 percent.

Watershed AK4A, located on the west side of Exchange Cove, totals 181 acres. Approximately 29 acres are located within HGC RMA's. Harvest of 10 acres under Alternatives 2, 4 and 5 increases the cumulative HGC harvest from 11 to 45 percent.

Watershed B30A, located on the northwest portion of Thorne Island, totals 689 acres. Of this, approximately 8 acres are within HGC RMA's. Harvest of 4 acres proposed under Alternatives 2, 3, and 5 would increase the cumulative HGC harvest from the current value of zero to 55 percent. Under Alternatives 4 and 6, harvest of 1.7 acres would increase the cumulative HGC harvest from zero to 23 percent.

Specific units that would cause a watershed to exceed the HGC harvest threshold were identified. Mitigation prescribed for these units includes retention of timber within the HGC stream RMA. The RMA will be managed to protect slope stability and water quality, and may include selective removal of the most wind-throw prone trees. If implemented, these mitigation measures will maintain HGC harvest levels below the threshold, or, for A22A, at current levels.

Habitat Capability Models

Table 3-43 presents the results of habitat capability models for three fish MIS species for years 2005, 2055, and 2145. Percent habitat capability relative to existing conditions (based on 1991 production) also is presented.

No change in pink salmon is projected for any future years; production is expected to be maintained at 1991 levels. The pink salmon model relies on available spawning habitat, which will remain constant with implementation of TTRA buffers on Class I and Class II streams. The coho salmon and Dolly Varden char model results reflect changes to rearing habitat (pools) due to altered large woody debris input rates. The models take into account regrowth of previously harvested areas that are now within TTRA buffers.

Table 3-43

Predicted Habitat Capability for 1995, 2005, 2055, and 2145 for Pink Salmon, Coho Salmon, and Dolly Varden Char of Lab Bay Project Area Streams and Lakes by VCU.

	Pink Salmon (smolts)				Coho Salmon (smolts)				Dolly Varden (fish)			
VCU	1995	2005	2055	2145	1995	2005	2055	2145	1995	2005	2055	2145
527	506,534	506,534	506,534	506,534	5,895	5,892	5,883	5,884	17,137	16,932	16,345	16,526
528	354,740	354,740	354,740	354,740	12,110	12,110	12,110	12,110	21,565	21,515	21,373	21,419
528.1	1,224,978	1,224,978	1,224,978	1,224,978	10,276	10,276	10,276	10,276	16,490	16,490	16,490	16,490
529	4,780,914	4,780,914	4,780,914	4,780,914	37,800	37,722	37,516	37,565	89,004	88,696	87,851	88,039
530	2,854,077	2,854,077	2,854,077	2,854,077	27,605	27,565	27,458	27,515	74,916	74,484	73,272	73,569
531.1	5,186,608	5,186,608	5,186,608	5,186,608	11,250	11,012	10,371	10,457	45,635	44,986	43,204	43,488
531.3	174,567	174,567	174,567	174,567	993	993	993	993	5,052	5,052	5,052	5,052
532	3,110,841	3,110,841	3,110,841	3,110,841	27,654	27,547	27,359	27,511	65,171	64,799	63,770	64,203
533	2,723,938	2,723,938	2,723,938	2,723,938	28,345	28,340	28,327	28,329	101,144	101,127	101,081	101,087
534	562,208	562,208	562,208	562,208	3,495	3,495	3,495	3,495	19,986	19,944	19,824	19,842
534.1	157,352	157,352	157,352	157,352	1,106	1,098	1,075	1,090	6,002	5,983	5,930	5,961
534.2	2,990,479	2,990,479	2,990,479	2,990,479	38,402	38,359	38,242	38,302	157,746	157,656	157,407	157,533
534.3	1,047,468	1,047,468	1,047,468	1,047,468	2,963	2,958	2,945	2,952	8,849	8,832	8,786	8,812
534.4	45,986	45,986	45,986	45,986	303	299	289	292	6,431	6,380	6,232	6,281
535	1,578,953	1,578,953	1,578,953	1,578,953	18,353	18,309	18,191	18,228	46,105	45,862	45,185	45,332
536	706,829	706,829	706,829	706,829	11,957	11,957	11,957	11,957	39,445	39,412	39,317	39,348
537.1	264,948	264,948	264,948	264,948	2,609	2,593	2,550	2,562	21,169	21,087	20,865	20,925
538	1,166,536	1,166,536	1,166,536	1,166,536	10,423	10,362	10,204	10,318	58,656	58,264	57,223	57,846
539	1,673,934	1,673,934	1,673,934	1,673,934	18,921	26,648	18,641	18,678	49,218	49,036	48,515	48,613
540	226,196	226,196	226,196	226,196	12,020	12,020	12,020	12,020	43,381	43,381	43,381	43,381
551	961,205	961,205	961,205	961,205	7,283	7,263	7,209	7,240	38,457	38,371	38,126	38,251
Total	**32,299,291**	**32,299,291**	**32,299,291**	**32,299,291**	**289,762**	**296,817**	**287,110**	**287,773**	**931,559**	**928,289**	**919,229**	**921,998**
Percent Relative to 1991	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**99.9%**	**102.3%**	**98.9%**	**99.2%**	**99.8%**	**99.4%**	**98.46%**	**98.8%**

Source: Kessler 1993.

Mitigation Measures

The National Forest Management Act (NFMA) sets the minimum standards for fish habitat protection on all of the National Forests. The Tongass Timber Reform Act (TTRA) provides specific direction for fish and riparian protection for the Tongass National Forest. The NFMA (36 CFR 219.27 (e)) establishes that management activities that have serious and adverse effect to fish habitat shall not be permitted.

The TTRA (Sec. 103) provides direction for fisheries protection by application of no harvest buffers of at least 100 feet wide on each side of a Class I stream, or a Class II that flows directly into a Class I stream. The Act calls for incorporation of Region 10 Soil and Water Conservation Handbook (FSH 2509.22), January 10, 1990, to assure the protection of riparian habitat on streams or portions of streams not protected by such buffer zones.

The TLMP Draft Revision (1991a) provides specific direction for implementation of the Stream and Lake Protection LUD, which incorporates both NFMA and TTRA requirements. Through delineation of Riparian Management Areas, their buffer components and corresponding management prescriptions, riparian areas are protected. This draft direction was adopted for planning of the Lab Bay Sale.

Forest-wide draft standards and guidelines and Best Management Practices (BMP's) for fish, riparian, soil, and water resources were specified for each proposed road and harvest unit. Mitigation measures include design of roads associated with anadromous streams to assure continued upstream passage of fish, protection of riparian area resources, and avoidance of accelerated sediment loads from roads and sideslopes. These measures are designed to prevent degradation of fish habitat, and effective and consistent application of these measures will prevent any significant decrease in fish habitat capability.

Additional mitigation measures were specified for units and roads based on field inventory. These measures include 1) widening of stream buffers to maintain shading on temperature sensitive streams and protect riparian resources; 2) providing for retention of timber on HGC streams to maintain cumulative harvest standards: and 3) requiring construction timing restrictions on Class II and III stream crossings in close proximity to Class I streams (see Unit and Road Design Cards in the Planning Record). Mitigation measures for fish resources are summarized in Chapter 2.

Monitoring

The Forest Plan recognizes three distinct types of monitoring: implementation, effectiveness, and validation. Implementation monitoring determines if projects and activities comply with Forest Plan standards and guidelines. Effectiveness monitoring determines whether the standards and guidelines achieve the desired results. Validation monitoring determines whether the assumptions in the Forest Plan regarding the relationship between management actions and their effects are correct, or if there is a better way to depict these relationships.

A monitoring plan has been developed for the Tongass National Forest by the Forest Planning Team and is described in TLMP Draft Revision (1991a). The Lab Bay Project Area would contribute towards meeting overall Forest Plan monitoring goals through the selection of proposed harvest units for monitoring. Recommendations for Forest Plan monitoring of fisheries resources for the Lab Bay Project Area have been documented in the Fisheries Resource Report (Smayda 1994) and the project planning record.

Project-specific monitoring that is unique to the Lab Bay Project Area, that would not be included in regular Forest Plan or routine implementation monitoring, has been identified for several resources. Project-specific monitoring is not identified for fisheries resources in the Lab Bay Project Area.

Chapter 2 summarizes how project activities relate to Forest Plan and Ketchikan Area monitoring plans, and describes project-specific monitoring opportunities.

Silviculture, Timber, and Vegetation

Key Terms

Advanced Regeneration - Natural conifer reproduction established beneath an existing forest canopy; comprised of trees ranging from 5-20 feet in height.

Allowable Sale Quantity (ASQ) - The maximum quantity of timber that may be sold in each decade from suitable scheduled lands covered by the Forest Plan.

Basal Area (BA) - The area of the cross section of a tree stem, or group of trees, measured at 4.5 feet above ground; usually presented as total square feet per acre.

Blind Lead - An area within a harvest unit that is difficult to yard (remove felled timber) with conventional cable logging systems on convex slopes.

Board Foot (BF) - A unit of timber measurement equalling the amount of wood contained in an unfinished board 1 inch thick, 12 inches long and 12 inches wide. One MBF = 1,000 board feet.

Climax Plant Community - The final or stable biotic community in a successional series which is self-perpetuating and in dynamic equilibrium with the physical habitat; the assumed end point in succession.

Commercial Forest Land (CFL) -Land that is capable of producing continuous crops of timber that has not been withdrawn from timber production (20 cubic feet of tree growth annually, or at least 8 MBF/acre).

Ecosystem - All of the organisms in a given area interacting with the physical environment so that the flow of energy leads to an exchange of materials between living and nonliving parts within the system.

Ecosystem - The complete system formed by the interaction of a group of organisms and their environment.

Even-Aged Management - The application of a combination of actions that result in the creation of stands in which trees of essentially the same age and height grow together. The age difference between trees in the canopy level usually does not exceed 20 percent.

Falldown - The difference between planned or scheduled harvest and that which is attained after implementation.

Forestland - Land at least 10 percent occupied by forest trees of any size, or formerly having had such tree cover and not currently developed for nonforest use.

MBF - Thousand board feet.

MMBF - Million board feet, or about 220 conventional highway logtruck loads of logs.

Plant Association - A basic unit of vegetation classification based on land management potential, species composition, successional patterns, and the climax plant community.

Precommercial Thinning - The practice of removing some trees of sapling size to reduce stocking and improve tree growing space. Trees will grow faster due to reduced competition for nutrients, water, and sunlight.

Key Terms (continued)

Retained Structure - Merchantable or submerchantable trees and snags that are left within the harvest unit to provide biological habitat components over the next management cycle.

Shade Tolerance - Plant species physiological growth adaptation to shade conditions. Shade tolerant species such as western hemlock are able to live in shaded conditions whereas shade intolerant species such as spruce are not adapted to shaded conditions.

Silvical Characteristics - Physiological and genetic characteristics of individual tree species and the ecological characteristics (biological and environmental factors) of the site in which enable specific species to be adapted to a particular and unique site.

Silvicultural Practices - Management techniques used to modify, manage and replace a forest over time. Silvicultural practices are classified according to the method of carrying out the process (shelterwood, seed tree, clearcut, commercial thinning, etc.).

Silviculture - The art, science, and practice of controlling the establishment, composition, structure, and growth of trees and other vegetation in forest stands.

Site Index - A measure of a forest areas relative productive capacity for tree growth. Measurement of site index is based on height of dominant trees in a stand at a given age.

Succession - A series of dynamic changes by which one group of organisms succeeds another through stages leading to a potential natural community or climax. The process of plant community development after disturbance involves changes in species composition over time.

Suitable Forestland - Commercial forestland identified as having the biological capability to sustain long-term timber production and administratively designated for such production.

Uneven-Aged Management - The application of management techniques which will maintain high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes. Cutting methods that develop and maintain uneven-aged stands are single-tree and group selection.

Volume Class - Classification system used to differentiate timber stands into similar average volume per acre categories or strata.

Affected Environment

The landscape of northern Prince of Wales Island is characterized by intermixed stands of productive hemlock/spruce forest, nonproductive forest stands, and nonforested areas. The spatial distribution of these stands can be traced back to the glacial and climatic history of the area which combined to shape soil development.

Soil drainage is the most influential factor on Prince of Wales Island for determining the type and amount of vegetation that grows. Poorly drained soils, such as those overlaying compact glacial till, result in the development of nonforested muskeg sites or unproductive forest stands. Well-drained soils, such as those overlaying limestone, result in highly productive forest stands.

Desired Future Condition

Planning for the Lab Bay Sale was conducted in accordance with the proposed Land Use Designation (LUD) system of the TLMP Draft Revision (1991a), which is more restrictive then the Forest Plan. The TLMP Draft Revision (1991a) describes the desired future condition expected

upon implementation of the Forest Plan for each LUD. Each LUD carries with it certain desires for the future condition of that area. Timber harvest can occur in areas designated as Modified and Highly Modified Environments.

Within the Project Area, Modified Environments consist of the Scenic Viewshed and Modified Landscape LUD's. The future appearance of these areas is expected to show a mosaic of timber harvest units of varying sizes and ages of origin interspersed with areas of old growth and nonforest vegetation. The landscape as viewed by most forest visitors will have a modified but still basically "natural" appearance.

Highly modified environments in the Lab Bay Project Area are found in the Timber Production LUD. In areas determined to be suitable forestland within this LUD, natural ecological processes will be replaced by timber management practices. The landscape will have a highly modified appearance, dominated by timber harvest and road building activities. These areas will contain timber harvest units of varying sizes and ages among areas of old growth and nonforest vegetation.

Ecosystem Management

A strategy to evaluate and manage ecosystems to provide for all associated organisms is the basis of ecosystem management. Under ecosystem management, new harvest planning strategies are examined and older strategies re-evaluated to balance timber production with other resource concerns. The basic intent of this concept is to imitate natural processes and to retain options for future management while more knowledge becomes available about the impacts of forest management activities on the ecosystem.

At the stand level, a variety of tools can be used within both even-aged and uneven-aged silvicultural systems. Under even-aged management, various types of clearcutting (with reserve trees), shelterwoods, or seed tree harvests are adapted to incorporate ecosystem management principles. These principles include identifying opportunities to retain snags and small patches of uncut timber in harvest units for future stand diversity. Uneven-aged silvicultural practices can include retention of snags and large woody debris and provide canopy gaps that promote future stand diversity similar to even-aged management practices.

Forestland Classification

National Forest System lands are defined by vegetative cover, soil type, and administratively designated land use. This classification scheme is intended to show the amount of land that is covered by forested vegetation and is capable of producing timber.

Suitable Forestland (TLMP 1979, as amended)

National Forest System lands are classified as tentatively suitable and suitable for timber harvest. This classification system is intended to show the amount of land within the Project Area that is available for timber production following the criteria established in the existing Forest Plan. The TLMP (1979, as amended) identifies 73,321 acres scheduled for timber harvest in Management Area K01 and K03 during the current rotation. The Lab Bay Project Area contains all of Management Area K01 and approximately 80 percent of Management Area K03.

Suitable Forestland (TLMP Draft Revision 1991a)

Appendix A of the TLMP Draft Revision (1991a) describes the process used to identify lands tentatively suitable and suitable for timber harvest. This classification scheme is intended to show the amount of land within the Project Area that is removed from timber production for reasons identified below. Table 3-44 identifies the Tentatively Suitable Land Base following the criteria in Appendix A of the TLMP Draft Revision (1991a). These criteria were adopted for planning of the Lab Bay Sale. The recently published 1996 TLMP Draft Revision proposes changes to the current Forest Plan system of Land Use Designation. The Preferred Alternative of the 1996 TLMP Draft Revision is based on the land classification system described below for Alternative P of the 1991 Draft Revision. The analysis provided below remains valid in light of the revisions proposed to the Forest Plan in the 1996 TLMP Draft Revision.

A leave tree island in an otherwise clearcut area as shown in an aerial photograph

Tentatively suitable forest lands are those that are producing or capable of producing crops of industrial wood and where (a) existing technology and knowledge indicates that adequate restocking can be attained within 5 years after final harvest; (b) adequate information is available to predict the effects of timber management activities; (c) timber can be produced without irreversible damage to soils, productivity, or watershed conditions; and (d) lands have not been withdrawn from timber production by Congress, the Secretary of Agriculture, or the Chief of the Forest Service.

Lands that are not federally owned are excluded from the tentatively suitable land base. Also excluded are nonforested areas, which support less than 10 percent forest cover or are currently being developed for nonforest use, and noncommercial forestlands consisting of old growth that currently does not contain at least 8,000 board feet of timber per acre. Lands capable of producing this volume are classified as commercial forestland. From this base, lands are withdrawn that are not geologically suited to harvest activities (nonproductive soils or those with very high mass movement potential), or that are administratively protected.

Additional areas are proposed for withdrawal from timber production under the TLMP Draft Revision (1991a), as shown on Table 3-45. Proposed Special Interest Area LUD's near El Capitan, Perue Peak, North Perue Peak and Mt. Calder are removed by Forest direction. All areas within 500 or 1,000 feet of the mean high tide along shorelines and estuaries, respectively, are removed for the Beach Fringe and Estuary LUD. The No Programmed Harvest buffer around streams and lakes, varying in width from 25 to 400 feet, and eagle nest buffers are also removed from the tentatively suitable base. The land that is available for timber production is derived by subtracting these land categories from the tentatively suitable base. The available acres are categorized as second growth stands or old growth forest. These two tables present the acres removed from the suitable forestland base in a stepwise fashion.

Table 3-44

Proposed Tentatively Suitable Forestland

	Excluded Acres	Total Acres
Total Project Area		174,357
Lakes	2,461	
Total Land Area		171,896
Nonnational Forest System Land	14,153	
National Forest System Land		157,743
Nonforested Land	6,851	
Forested Land		150,892
Noncommercial Forestland	44,577	
Commercial Forestland		106,315
Nonsuitable Forestland		
Very Low Site Index Soils	6,601	
Very High MMI Soils	285	
McGilvery Soils	0	
LUD II	10,038	
Stream & Lakes Protection LUD (No Commercial Harvest Buffer per TTRA)	3,982	
Tentatively Suitable Forestland		85,409

Source: Ketchikan Area GIS

Table 3-45
Proposed Suitable Forestland

	Excluded Acres	Total Acres
Tentatively Suitable Forestland		85,409
Land Removed by Forest Direction		
Special Interest Area LUD	1,970	
Beach Fringe & Estuary LUD	9,045	
Eagle Nest Buffer	16	
Stream & Lake Protection LUD (No Programmed Harvest Buffer)	248	
Land Available by Forest Direction		74,130
Second Growth	26,531	
Available for Harvest		47,599

Source: Ketchikan Area GIS

Field verification of proposed harvest units in the summers of 1992 and 1994 resulted in the identification of additional nonsuitable forestlands not previously mapped. Areas identified within and adjacent to proposed harvest units with very high MMI soils and McGilvery soils greater than 41 percent were excluded from proposed harvest units and the suitable timber base. Most of these areas are identified as noncommercial forestland and therefore are not listed under the categories for very high MMI and McGilvery Soils.

Previous Harvest

The earliest commercial timber harvest on central Prince of Wales Island occurred during the late 1930's and early 1940's. This coincides with the increased need for high quality spruce used in airplane construction prior to World War II. The amount of logging at this time was very limited and restricted to easily accessible coastal shorelines as there were no roads in the area.

Development of the logging road system on central Prince of Wales Island began in earnest in the mid-1970's. This marked the beginning of intensive land-based logging efforts which continue today. The most accessible areas were logged first, and areas with difficult access and poorer quality timber were left. Some of the early harvesting and road building isolated these lower quality stands from possible future harvest. Table 3-46 shows the area logged since 1950.

Table 3-46
Lab Bay Project Area Previous Harvest Acres

Harvest Period	Acres
1950 -1954	43
1955 - 1959	117
1960 -1964	1,457
1965 -1969	3,856
1970 - 1974	2,846
1975 - 1979	5,391
1980 -1984	6,047
1985 - 1989	5,829
1990 - 1994	5,805
Total	**31,393**

Source: GIS query, USDA Forest Service, TNF

* Includes previous harvest acres on lands currently defined as not suitable for timber harvest, such as congressionally-designated LUD IIs and TTRA stream buffers.

Silvical Characteristics of Tree Species

Silvical characteristics are the physiological (genetic) characteristics of the individual tree species and ecological characteristics (physical and biological) that combine to produce the trees on any particular site. The general silvical characteristics of the commercial tree species within the Lab Bay Project Area are described below and are used as the basis for managing the species and stands of timber.

Sitka Spruce

Sitka spruce (*Picea sitchensis*) is found along a narrow strip of the northern Pacific coast from northern California to south-central Alaska. Throughout most of its range it is associated with stands of western hemlock. The high strength-to-weight ratio has made this species valuable for lumber, specialty construction, and paper products.

In Southeast Alaska, spruce is generally classified in the intermediate shade tolerant class, being less tolerant of shading than western hemlock. Under natural conditions spruce has the ability to germinate on most any seedbed, including rotten logs. Seedling survival is best on exposed mineral soils or mixed mineral and organic soils with adequate moisture and drainage. On poorly drained sites, woody debris is considered a requirement for spruce reproduction.

Spruce is a shallow-rooted species and blowdown is the most prominent damaging agent in Southeast Alaska. Thin bark also makes it very susceptible to damage from logging. Injuries from logging or adjacent windfall frequently introduce decay-causing organisms to standing trees.

Western hemlock *(Tsuga heterophylla)*

Western Hemlock

Western hemlock (*Tsuga heterophylla*) is found along the northern Coast, Cascade, and Rocky Mountain ranges. It is frequently associated with stands of Sitka spruce. The strength and long cellular fibers have made this species valuable for construction and paper products.

Western hemlock is very tolerant of shade and is able to germinate and grow in the understory. It produces an abundant quantity of light-weight seeds which have the ability to germinate on most

any seedbed. In Southeast Alaska, germination and initial growth is best in mineral soils with a high amount of organic matter. Because of its shallow rooting habit, hemlock is subject to windthrow. Although less susceptible to bark injury than spruce, hemlock injury often will result in greater volume loss due to decay-causing organisms. Dwarf mistletoe is a common parasite on western hemlock throughout Southeast Alaska. This parasitic plant reduces the growth of the infected trees and allows entry of decay-inducing organisms.

Mountain Hemlock

Mountain hemlock (*Tsuga mertensiana*) is found between sea level and timberline along the northern Coast, Cascade, and Rocky Mountain ranges. The wood quality is similar to that of western hemlock. Mountain hemlock often replaces western hemlock at the higher elevations because of its adaptation to cooler sites. At lower elevations it is often associated with poorer sites because of its ability to extract tightly bound nutrients from the soil.

Seedlings are very shade tolerant, comparing favorably with western hemlock; however, growth is generally slow (Harlow and Harrar 1958). Seedlings and small saplings are more able to tolerate heavy snowpacks because bent boles and branches spring erect after snowmelt.


Western red cedar *(Thuja plicata)*

Western Red Cedar

Western red cedar (*Thuja plicata*) is found along the northern Coast, Cascade, and Rocky Mountain ranges and is frequently associated with stands of western hemlock. The durability and rot resistant qualities of western red cedar have made this species valuable for shingle products, utility poles, and various pulping products.

Western red cedar is shade tolerant, although less tolerant than western hemlock. In Southeast Alaska this species becomes established on the lower elevation, warmer sites. Red cedar germinates better on exposed mineral soil, but due to its slow growth, does not compete well against western hemlock. Seedling establishment and growth are dependent upon shaded conditions and adequate moisture. Red cedar is able to survive and grow on soils that are low in nutrients, therefore outcompeting other species on these sites.

Western red cedars generally have a deeper root system than western hemlock. Windthrow is less common for this species in Southeast Alaska because it grows on lower quality sites with a more open canopy structure. It is less susceptible to most decay-causing organisms than other species, yet due to its long lifespan, heart rot is common.

Yellowcedar

The primary range of Alaska yellowcedar (*Chamaecyparis nootkatensis*) is along the west coast and islands of British Columbia and Southeast Alaska. Within Southeast Alaska, yellowcedar is found in association with stands of western hemlock and occasionally mountain hemlock or western red cedar. Yellowcedar is one of the slowest growing conifers in the Northwest, producing highly durable wood with good milling qualities.

Yellowcedar is classified as intermediate shade tolerant in the northern part of its range. It germinates best on exposed mineral soils, yet hemlock and spruce are stronger competitors on these sites. This species grows best on colder sites in contrast to western red cedar and is therefore found at mid-to upper elevations.

Windthrow is less common for this species because it is found on lower quality sites with a more open canopy structure. It is resistant to most decay-causing organisms, yet due to its long lifespan, damaged trees are common.

Lodgepole Pine

This species is common to muskegs and on benches near lakes. It is shade intolerant, and develops best in areas between muskeg and hemlock stands. In poorly drained areas it is characterized by a short, often contorted bole and a dense, irregular crown of twisted branches. The tree is one of the first to invade peat bogs. Lodgepole pine is seldom harvested commercially in Southeast Alaska because of its rarely saleable quality and quantity.

Forest Plant Communities

The Lab Bay Area is a mosaic of coniferous forest interspersed with muskeg, shrubland, alpine vegetation and beach fringe plant communities. The communities have been categorized using the Tongass Forest Plant Association Management Guide (USDA Forest Service 1992e), which describes vegetative communities that may develop over time in response to soil, climate, plant geography, and evolution. This classification system helps to predict the outcome of various vegetative manipulations.

GIS information and field observations indicate that Project Area exhibits six plant series as shown in Table 3-47. Plant associations showing the same climax tree species are referred to as a series.

Table 3-47
Plant Communities in the Lab Bay Project Area

Plant Communities	Acres
Western Hemlock Series	30,194
Sitka Spruce Series	1,903
Mixed Conifer Series	79,680
Mountain Hemlock Series	8,084
Western Hemlock/Yellowcedar Series	1,858
Western Hemlock/Western Red Cedar Series	28,519

Source: GIS query, USDA Forest Service, TNF

Western Hemlock Series

The Western Hemlock Series is common throughout the Project Area and typically occurs on uplands such as hills, mountain sideslopes, and footslopes with poorly drained to well-drained soils. It occurs from sea level to timberline, but is usually below 1,000 feet elevation. This series is dominated by western hemlock in the overstory. Although Sitka spruce occurs within these stands, it provides 25 percent of the overstory cover. Harvested areas are likely to restock to hemlock from seed. The shrub layer is dominated by blueberry and rusty menziesia, although devils club can be a major component in wet areas. This association occurs primarily on the medium to highly productive sites.

The plant associations in the Sitka Spruce Series are associated with disturbed sites below 1,500 feet in elevation.

Sitka Spruce Series

This series is dominated by spruce in the overstory, but western hemlock may provide up to 40 percent cover as a co-dominant species. The plants in this series typically are associated with disturbed sites such as riparian areas, alluvial fans, or avalanche chutes from sea level to 1,500 feet elevation. The most productive Sitka spruce associations occur in riparian areas below 300 feet.

Disturbed soils frequently invite alder or salmonberry establishment during the initial stage of succession. Competition from these species can restrict the establishment of conifer seedlings and retard the growth of young stands. The southwestern portion of the Lab Bay Area is especially prone to alder incursion due to high seed availability from mature alder on previously disturbed sites. Common shrub species include devils club, blueberry, and salmonberry.

Mixed Conifer Series

Mixed conifer associations are identified by an open conifer overstory which is not dominated by any single species. Overstory species include mountain hemlock, western hemlock, yellowcedar, and western red cedar. Shore pine and spruce also occur in varying proportions. Associations in this series are mostly influenced by poor soil drainage and generally found in the uplands associated with muskegs or in lower elevations surrounding and associated with glacial drumlins. These communities are stable and slow to change. Since tree growth on these sites is slow, recovery from severe disturbance likely will be slow. Although these associations occur throughout the Project Area, they are most common in the northeast corner, on Thorne Island, and in the upper portion of the Marble Creek drainage.

Mountain Hemlock Series

These associations are found primarily on the cold, high-elevation slopes and mountain summits, above the western hemlock series. Mountain hemlock is the dominant overstory tree species and at lower elevations is commonly associated with yellowcedar. The shrub layer is dominated by blueberry. Productivity is limited due to the shorter growing season at high elevations and by poor soil drainage and shallow soils common to some areas. Because of the dense shrub layer and poor growing conditions, these sites probably require substantial time to return to a climax condition after disturbance.

Yellowcedar *(Chamaecyparis nootkatensis)*

Western Hemlock-Yellowcedar Series

This series can occur at all elevations below the subalpine zone, but is primarily found on stable mountain slopes, hillslopes, and footslopes where drainage or root growth are impeded. Soils may be deep and somewhat poorly drained or shallow and moderately well drained. Dominant overstory species in this series are western hemlock and Alaska yellowcedar, but western red cedar may also be present. Hemlock seedlings are abundant while yellowcedar seedlings are uncommon. Blueberry is the dominant shrub with rusty menziesia common.

These sites will restock predominantly to hemlock through seeding and advance regeneration. Soil disturbance tends to lead to Sitka alder and salmonberry incursions. Yellowcedar is not expected to be a significant component of the new stands unless seed trees are retained or planting is undertaken to restock the area. Complicating this are the poor seeding abilities and slow growth of yellowcedar (DeMeo 1992).

Western Hemlock-Western Red Cedar Series

These associations are commonly found at the lower elevations of mountain slopes and in the lowlands. Western red cedar is primarily found at elevations below 900 feet. The overstory is dominated by western hemlock, with western red cedar occupying 10 to 25 percent of the forest canopy. Yellowcedar may also occur. Blueberry is a common shrub species. This series is most common on moderately to highly productive sites in rolling hill country, low hills and mountain slopes. Generally this series is situated in warmer areas in association with the lower elevations of the Western Hemlock Series.

Nonforested Vegetation Communities

Nonforested plant communities in the Lab Bay Project Area include alder shrublands, landslides, rock, muskeg, and estuary sedge tidal flats. This section describes the alder shrub lands, landslides, and rock communities, while the Floodplains, Riparian, and Wetlands section addresses the muskeg and estuary plant communities. Table 3-48 shows nonforest plant communities within the Project Area.

Table 3-48
Nonforested Plant Communities

Community Type	Acres
Alder Shrublands	939
Landslides	632
Rock	4;217

Source: GIS query, USDA Forest Service, TNF

Alder Shrublands
This vegetation type is typically found in areas which are frequently disturbed such as rocky or unstable slopes between the treeline and alpine meadows, and extending down through the forest through avalanche tracks and along streams. These high elevation sites are composed of Sitka alder. Other shrub species associated with this plant community are *Vaccinium spp.* and *Menziesia.*

Landslides
These are current and former landslide areas that are beginning the process of healing through revegetation. Much of the vegetation consists of Sitka alder, other brush species, and some conifers.

Rock
These are generally high elevation sub-alpine to alpine sites that support very little vegetation. Most of these areas consist of large bluffs, exposed bedrock and rubble. The exposed ridges and mountaintops above timberline often consist of alpine lichen rock outcrops or barren rocks and rubble interspersed with low mat plants, both herbaceous and shrubby. The most important plants are the low heath shrubs, especially cassiopes and mountain heath. Plant cover does not exceed 50 percent within the alpine-rock habitats.

Forest Health

A healthy forest will produce industrial wood products with minimal repression from biological and physical agents. The general health of the timber stands in the Lab Bay Project Area are influenced by hemlock dwarf mistletoe and windthrow. The following paragraphs describe the most destructive agents observed during field investigations. Pathogens observed which are not economically destructive are Sirococcus shoot blight (*Sirococcus strobilinus*), identified in the Big Creek Drainage near Unit 533-201 and near Buster Creek in Unit 530-226, and hemlock needle rust (*Pucciniastrum vaccinii*), identified in the Big Creek drainage near Unit 533-201 and near the summit of Road 20 in Unit 533-250. Potentially damaging pests not observed but reported to exist at naturally balanced levels in the Project Area include the black-headed budworm (*Acleris gloverana*), the hemlock sawfly (*Neodiprion tsugae*), the spruce beetle (*Dendroctonus rufipennis*), and the spruce aphid (*Elatobium abietinum*) (Holsten et al. 1985).

Hemlock Dwarf Mistletoe
Hemlock dwarf mistletoe (*Arceuthobium tsugense*) is one of the most widespread pathogens in old-growth forests of Southeast Alaska. Hemlock dwarf mistletoe is an obligate parasitic plant whose primary hosts are western hemlock and mountain hemlock. In general, dwarf mistletoe reduces the vigor and growth rate of its hosts. Dwarf mistletoe produces cankerous swellings in branches that offer an entry point for wood-destroying fungi. The spread of dwarf mistletoe occurs from an explosive seed dispersal mechanism. Spread is most rapid in multistoried stands because the seeds fall onto the lower canopy levels.

Hemlock dwarf mistletoe is present throughout the entire Lab Bay area, but infection rates are quite variable for individual stands. It is completely absent in some stands while nearly every tree is infected in other stands. The most heavily infected areas were observed immediately South of Labouchere Bay (Unit 527-224) and in the lower Alder Creek and Flicker Creek drainages (Units 529-202 and 529-286). Areas with moderate levels of infection include the stands within and surrounding Units 529-282 (Alder Creek), 530-226 (Buster Creek), 532-221 (Pine Creek), 536-208 (near Calder), and 539-215 (Exchange Peninsula).


Yellowcedar twig with cones

Yellowcedar Decline

Decline in yellowcedar was observed throughout the Project Area but was most evident in the area surrounding Pine Creek (portions of VCU 532 and 534.1), Thorne Island and in the upper Marble Creek drainage (Units 531.1-239, -241 and -242). The cause of yellowcedar decline is unknown, but the decline is associated with poorly drained soils. It does not seem to spread from site to site, but it appears to creep from its origins in bog and semi-bog communities to the adjacent forest. As drainage improves, yellowcedar decline is reduced.

General Decays

Stem and root decay is a major cause of merchantable timber volume loss in the Project Area, although this is not unexpected considering the age of the stands. The younger stands generally show less evidence of decay than the older stands which are more likely to be infected. Red ring rot (*Phellinus pini*), red belt fungus (*Fomitopsis pinicola*), yellow ring rot of western red cedar (*Phellinus weirii*), or root rots (*Heterobasidion annosum* and *Armillaria mellea*) are some common pathogens in the area. Hemlock is generally more susceptible to decay than other species in the area.

Western Hemlock Canker

Western hemlock canker (*Xenomeris abietis*) is causing slowed growth and mortality of western hemlock along well-traveled rock-surfaced roads. This occurs in a strip approximately 150 feet wide on either side roads. It is most evident in occasional patches along each side of Road 20. Significant infection occurred throughout Unit 537.1-208 and along the edge of Unit 534-218. It was also observed in Unit 530-240 east of Buster Creek and along the road in the lower portion of the Big Creek drainage. It affects the lower branches of large trees and eventually kills the smaller, younger trees. Road dust is suspected to be associated with this problem, and signs of the disease have decreased after paving some heavily traveled roads in the central portion of the Island (Hennon 1992).

Hemlock Fluting

Hemlock fluting was found in the vicinity of Labouchere Bay and Protection Head and has been reported near Calder. Fluting is characterized by deep vertical furrows in the stem of hemlock trees. The presence of furrows reduces the value of hemlock trees for sawlogs and pulping because of irregular grain and the bark that is contained within the bole of the tree. The cause of fluting is unknown but it is believed to have a genetic origin. Retention of hemlock trees that do not show early signs of fluting would be desirable during thinning operations to reduce its presence in future stands.

Windthrow

High winds historically have blown down patches of trees and individual trees throughout the Project Area during winter storms. The prevailing winds are associated with southeast gales (Harris 1989). This is the primary method of natural forest reproduction in this area since extensive fires are precluded by the moist, maritime climate. All commercial species are shallow-rooted and susceptible to windthrow, but the most damage occurs in the high-valued, dense stands of spruce and western hemlock exposed to the ocean winds.

This project has incorporated much of the information that is available to design units to minimize the potential for windthrow after harvest. Characteristics of windfirm trees are shown below (Harris 1989):

1. Open grown trees which have been exposed to storm winds throughout their life.
2. Dominant trees with crowns well above the average stand height.
3. Low form class, high stem taper, and are short.
4. Prop roots, especially on the leeward side.
5. Straight trees, with well-formed stem and no lean.
6. No stem or root decay and no stem swelling.
7. Deep rooted on well-drained sites.
8. Western red cedar, Alaska yellowcedar, and immature older species.

Timber Classifications

Timber stands are classified in order to differentiate them by forest type, volume class, and size class. These classifications were originally mapped in the 1970's and are the basis of the timber inventory system of the Tongass National Forest. Timber type mapping information is retained and updated in the Tongass GIS system for ease of use and analysis.

Volume Class and Forest Type

Commercial Forestland (CFL) is classified by volume class and forest type. Volume Classes are designed to represent a range of net sawlog timber volumes expected to be present. Volume Class 3 is CFL which contains less than 8 MBF/acre; examples include poorly stocked, recently harvested, and immature stands. Volume Classes 4 through 7 contain trees of merchantable size with more than 8 MBF/acre. Volume Classes (VC) are defined in Table 3-49.

Table 3-49
Volume Class Definitions

Volume Class	Net Sawlog Volume (MBF/acre)
VC 3	0 - 8
VC 4	8 - 20
VC 5	20 - 30
VC 6	30 - 50
VC 7	50+

Source: TLMP (1979, as amended)

Forest Type defines the dominant overstory species expected to be present in the area. There are four forest types present within the Lab Bay Project; Cedar (C), Hemlock (H), and Hemlock-Spruce Mix (X), and Spruce (S).

Site Class

Site class is a measure of the relative productive capacity of a parcel of land for tree growth. This measure is used to predict future timber yields and to set silvicultural priorities. Site class is a function of soil type, the productive potential of the soil, and topographic position. Estimates of site productivity in Southeast Alaska old growth stands are best obtained by examining the soil. The soil-site relationships have been developed primarily upon depth and drainage of soil and parent material (Ruth and Harris 1979).

Soil classification mapping was conducted on Prince of Wales Island to provide broad information on soil types and their implications on management activities. Soil mapping is conducted

through aerial photo interpretation of existing vegetation and correlating field verified soil/vegetation relationships. These procedures provide a high level of confidence in the soil classification over large areas, but may result in inaccurately mapped soil types at the local level. The distribution of site classes, as mapped in GIS, throughout the Project Area is shown in the table below.

Table 3-50
Site Class Distribution Within Lab Bay VCU's

VCU	1 Very Low	2 Low	3 Medium	4 High
527	114	534	1,778	3,754
528	574	1,603	749	1,426
528.1	526	1,150	743	1,607
529	974	6,020	2,263	5,514
530	1,309	5,655	957	2,474
531.1	2,974	6,185	1,784	5,018
531.3	219	1,339	791	587
532	1,335	6,469	3,867	3,300
533	3,639	4,545	1,437	3,490
534	1,800	4,420	245	2,522
534.1	18	1,734	6	183
534.2	974	3,401	51	947
534.3	846	3,601	55	166
534.4	177	1,273	245	739
535	889	3,953	856	1,195
536	1,571	2,346	519	2,224
537.1	1,784	1,651	110	1,681
538	482	3,073	598	3,921
539	160	4,594	889	2,646
540	155	3,410	647	337
551	353	5,167	2,062	68
Total	**20,872**	**72,125**	**20,650**	**43,799**

Source: GIS query, USDA Forest Service, TNF

Volume Estimates

Timber inventory estimates for the Lab Bay Project Area were compiled from stand exam sampling of proposed harvest units. Field investigations conducted during the summers of 1992 and 1994 resulted in estimates of volume per acre, trees per acre, and basal area per acre for each volume class. Field investigations and stand exams were completed during the summer of 1995 and have resulted in revised inventory estimates for the Final EIS.

Volume deductions were applied for hidden defect, breakage, and utility. These deductions are based upon the TLMP Draft Revision (1991a) figures (minus 7 percent for visible defect identified during the stand exam inventory) and are as follows: 20 percent deduction for VC 4, 15 percent for VC 5, 14 percent for VC 6, and 13 percent for VC 7. The merchantable volume by unit is shown in Appendix D. Estimates derived from the inventory are shown in Table 3-51.

Table 3-51
Inventory Volume, Number of Trees, and Basal Area per Acre by Volume Class

	VC 4	VC 5	VC 6	VC 7
Volume (BF/Acre)*	12,544	25,347	34,402	44,557
Trees/Acre	114.5	110.4	103.5	124.6
Basal Area/Acre	160.7	205.3	231.5	262.2

Source: Boyce 1993

* Includes a hidden defect and breakage deduction

Typically the number of trees per acre in natural stands will decrease as the volume per acre increases because more volume will be concentrated on fewer, larger stems (Oliver and Larson 1990). The inventory results show that this is generally the case, until reaching Volume Class 7, where the number of trees per acre is the highest. This may be because some of the sampled stands were formed after a large blowdown event and show characteristics of a managed second growth stand. As expected, the basal area per acre shows an increase from the low Volume Classes to the higher Volume Classes.

Species composition is detailed in Tables 3-52 and 3-53. As expected, the cedars have a larger percentage of volume in the lower Volume Classes due to their ability to grow in poor soils. The higher volume classes are comprised of mostly western hemlock and spruce which are able to outcompete the cedars in good soils. Species composition estimates may be used for economic evaluations and habitat evaluations. The estimated number of snags per acre is presented in the wildlife habitat evaluation to ensure compliance with Forest-wide standards and guidelines.

Table 3-52
Percent Volume Composition by Species and Volume Class

Species	VC 4	VC 5	VC 6	VC 7
Sitka Spruce	15.3	26.6	17.2	20.4
W. Hemlock	31.2	47.8	68.9	72.8
W. Red Cedar	17.2	8.3	3.3	3.0
A. Yellowcedar	25.7	12.9	10.4	3.5
M. Hemlock	10.0	4.4	0.2	0.3
Lodgepole Pine	0.6	0.0	0.0	0.0
Total	**100.0**	**100.0**	**100.0**	**100.0**

Source: Boyce 1993

Table 3-53
Percent Species Composition Based on Trees per Acre

Species	VC 4	VC 5	VC 6	VC 7
Sitka Spruce	5.9	9.7	7.0	10.5
W. Hemlock	35.2	58.6	76.1	79.0
W. Red Cedar	20.7	10.4	1.8	1.9
A. Yellowcedar	26.9	16.5	14.4	8.5
M. Hemlock	10.5	4.8	0.7	0.1
Lodgepole Pine	0.8	0.0	0.0	0.0
Total	**100.0**	**100.0**	**100.0**	**100.0**

Source: Boyce 1993

An estimate of the standing old growth sawtimber volume available within the Lab Bay Project Area for harvest during the 1994-2054 period is shown in Table 3-54. The total volume is determined by applying the average volume per acre for each Volume Class strata from the timber inventory estimate to the Volume Class acreage of the remaining suitable and available timber.

Table 3-54
Estimated Volume of Remaining Suitable and Available Timber

Volume Class	Acres[2]	Avg. Vol. BF/Acre[1]	Total Volume (MBF)
VC4	15,697	12,544	196,903
VC5	18,135	25,347	459,668
VC6	11,030	34,402	379,454
VC7	2,737	44,557	121,953
Total	**47,599**		**1,157,978**

Source: Ketchikan Area GIS

1 Includes hidden defect and deduction.

2 Excludes previous harvest acres within the proposed suitable base.

Silviculture

The practice of silviculture takes into account the interaction of soils, climate, and tree physiology in determining how a stand of trees can be harvested, reproduced, and tended to achieve the desired future condition of the stand. Silvicultural practices are directed at creating and maintaining the type of forest that will best fulfill the objectives of the land manager.

Silvicultural practices by the Tongass National Forest on Prince of Wales Island primarily center around the management of four tree species: western hemlock, Sitka spruce, western red cedar and yellowcedar. The silvical characteristics of each species results in the development of different management approaches for a site based on the existing stand condition and the desired future condition.

Criteria for Selection of Silvicultural Harvest System

Several silvicultural systems are recommended to accomplish the management objectives for the Project Area. These recommendations take into consideration the ecological characteristics of the stands and the physical characteristics of the terrain. Silvicultural prescriptions were developed for all the units in each alternative. A sample of these prescriptions can be found in Appendix G.

The criteria for the selection of silvicultural methods on the Tongass National Forest are provided in the Alaska Regional Guide (USDA Forest Service 1983) and are summarized below. The selected method should:

- Be capable of meeting special management and multiple use objectives.
- Permit control of vegetation to establish desired species composition, density, and rates of growth.
- Promote a stand structure and species composition which minimize risks from solar radiation, disease, and windthrow.
- Use available and acceptable logging methods.
- Assure that lands can be adequately restocked.
- Be practical and economical in terms of transportation, harvesting, preparation, and administration of timber sales.
- Not base selection solely on the basis of greatest dollar return or highest output of timber.
- Not permanently reduce the site productivity or impair water and soil resources.

Silvicultural Systems

Standard silvicultural systems were used for the management of even-aged and uneven-aged stand conditions. Modifications to the standard systems were applied where necessary to protect resources, ensure logging feasibility, and provide timber volume.

Harvest Types

A harvest type describes a general silvicultural treatment that will be applied to the units in the Project Area. Each harvest type is designed to implement a particular silvicultural system. The harvest type descriptions are summarized below, with a more complete description presented in Appendix D.

Type A - Clearcut which leaves unmerchantable trees and snags within 50 to 100 feet of unit edges and between internal boundaries.

Type B - Clearcut which leaves some merchantable reserves trees and unmerchantable trees along the unit edges and between internal setting boundaries.

Type C - Clearcut which leaves unmerchantable trees and safe snags throughout unit.

Type D - Clearcut where groups or strips are retained between patches of clearcut timber.

Type E - Overstory removal which removes the larger size/height classes down to a specified size class.

Type F - Seed tree harvest which retains dominant and co-dominant trees in clumps or scattered across the unit.

Type G - Shelterwood harvest where 30 percent of the merchantable tree canopy is left scattered across the unit

Type H - Shelterwood harvest where 50 percent of the merchantable tree canopy is left scattered across the unit

Type I - Group/single tree selection which removes trees in all size classes, either singly or in groups.

Table 3-55 identifies the target amount of canopy and volume retained in the unit after implementing each of these harvest types. These values are targets only; actual retention values will depend on site-specific harvest conditions.

Table 3-55
Harvest Type Designations Based on Silvicultural System and Retention Level

Silvicultural System	Harvest Type Designation	Canopy Retention (%)	Unit Volume Reduction (%)
Clearcut	Type A	5	0
Clearcut	Type B	10	5
Clearcut	Type C	5	0
Clearcut (strip or group)	Type D	5 - 50	5 - 50
Overstory Removal	Type E	10 - 15	10
Seed Tree	Type F	10 - 15	10
Shelterwood	Type G	30	30
Shelterwood	Type H	50	50
Group/Single Tree Selection	Type I	40 - 75	40 - 75

Source: Lab Bay Planning Record

Silvicultural System Modifications

The harvest types described above incorporate modifications to the standard silvicultural systems to achieve different objectives and address site-specific concerns. The modifications allow for the protection of physical and biological productivity and aesthetics values. Modification to the standard silvicultural systems take the form of leave tree islands and partial cut zones. Where these modifications have been proposed, they are incorporated directly into the harvest type descriptions and the silvicultural prescriptions for each unit.

Creation of Partial Cut/Individual Tree Management Zones

Partial cut zones are created by removing trees in one size class or removing individual trees throughout all size classes along a lake, stream buffer (except TTRA streams), or unit boundary. Selection of partial cut zones was identified during field verification, unit layout, and ID Team review. Partial cut zones are used to achieve objectives for wildlife, visuals, or windfirm buffers and typically could be applied adjacent to key resource areas such as wildlife corridors. Partial cut practices can be used with all types of silvicultural and harvest methods where areas of retention are desired to provide additional structure within the future second growth stand.

Snag and Green Tree Retention

Snag and green tree retention will be implemented for all proposed harvest units within the Lab Bay Project Area to meet watershed level wildlife snag density requirements of the TLMP Draft Revision (1991a). Areas with low snag densities may be required to retain green trees in order to provide replacement snags over time. Units were designed to closely follow the operational guidelines described in the Region 10 Reserve Tree Selection Guidelines (USDA Forest Service 1993c).

Retaining green trees and snags across the landscape can provide benefits for reforestation, wildlife habitat, and visual resources. The desired level of retention and location of retained

trees within a harvest unit will be dependent upon the resource needs of the area, topographic and climatic conditions, and the operational constraints of logging systems. Much of the green tree retention will be placed around the edge of unit boundaries, in wider stream buffers, lake buffers, between logging system settings, and behind blind leads; although clumping and redistribution may take place. Retention of cedars will be emphasized over hemlock and spruce due to its wind resistant characteristics. A detailed description of watershed level snag density concern ratings is provided in the wildlife section of this chapter.

Even-aged Systems

Even-aged systems produce distinct successional stages because the age and size class structure of the trees in the stand are nearly the same. Some of the common systems are the clearcut, shelterwood, and seed tree.

Clearcutting

Clearcutting is the practice of harvesting all the trees on the site and establishing regeneration through natural or artificial methods. Decisions to clearcut are usually based on a number of factors such as insect epidemics, disease control, the desire to influence species composition and growth, and/or the desire to meet the needs of regulated volume production through area control. Clearcutting is the most common method prescribed in Southeast Alaska for the following reasons:

1. Spruce-hemlock stands are shallow-rooted and vulnerable to windthrow, especially in stands with a uniform canopy structure and that are exposed to prevailing winds.
2. It is the most effective, efficient, and economical method to reduce and control the spread of dwarf-mistletoe.
3. It benefits the establishment of shade intolerant species such as spruce by creating favorable seed beds and it reduces the competitive advantage of hemlock by destroying more of the advanced regeneration during logging.
4. There is sufficient evidence that adequate regeneration is possible from adjacent seed sources to restock clearcut sites.
5. Spruce and hemlock are thin-barked species. During partial cutting, accidental logging damage creates wounds which are susceptible to disease infection.
6. It increases short-term wildlife forage production.
7. It reduces harvesting costs per unit of volume.
8. Fewer road miles are required for the same level of volume harvested by other methods.

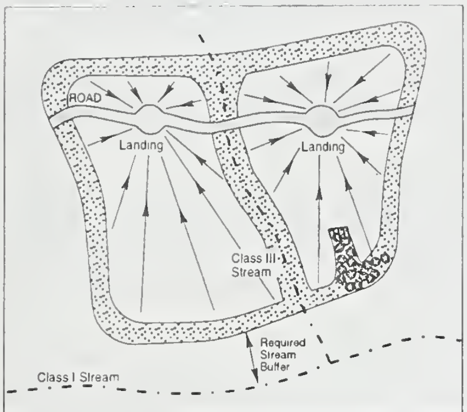
Clearcutting is the most common method recommended for the Lab Bay Project Area.

Some disadvantages of clearcutting include: 1) seedling distribution is uneven, leaving some areas overstocked and/or understocked; 2) species control is poor without planting; 3) cedar re-establishment is poor in clearcuts because "there are a host of other species in Southeast Alaska that compete better on disturbed soil" (DeMeo 1992); 4) reduced protection against erosion, landslides, and water runoff rates; and 5) the risk of blowdown along cutting boundaries is increased.

The four types of clearcuts described below have been designed to promote logging efficiency and safety while providing for short- and long-term objectives for other resources. Figure 3-10 presents schematic diagrams of the four clearcut harvest types. The diagrams represent one possible way of achieving the snag and green tree retention objectives defined below for each clearcut type. All clearcuts will use at least one of the following forms of snag and green tree retention:

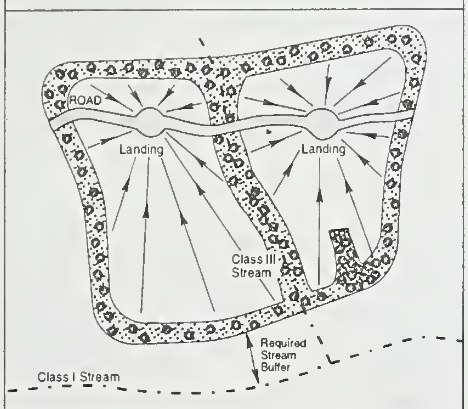
- *Type A* retention typically will leave snags and unmerchantable green trees 50 to 100 feet inside of the unit boundary and between setting boundaries, where conditions allow. Approximately 5 percent crown cover will be retained.

Figure 3-10
Clearcut Harvest Types (Schematic)



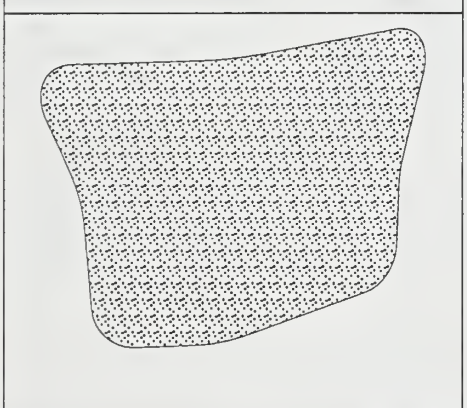
TYPE A Criteria for tree selection and retention zones, as described below, would be followed by the operator during unit layout.

- Retain sufficient structure to maintain 2.75 snags per acre over time. Selected trees and snags should consist of (1) mistletoe-free trees, (2) less merchantable or unmerchantable trees, and (3) trees that lean into retention zones.
- Select trees 50 to 100 feet from the outer boundary of all settings, where conditions allow.
- Retain trees behind identified blind leads.
- Directional fell trees outside retention zones.
- Designate species and D.B.H. of retention snags and green tree replacements.
- Leave trees in clumps at unit boundary, where feasible.
- Utilize 100-foot buffers of Class I streams and Class II streams that flow into Class I streams within the unit.



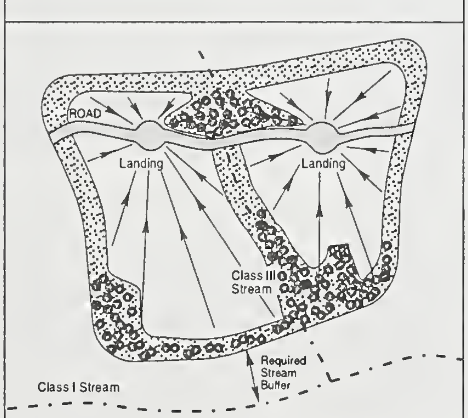
TYPE B The operator would implement harvest according to Type A guidelines, leaving additional trees and snags necessary to meet prescribed snag level requirements within a watershed. Selection of additional trees would be retained as follows:

- Increase the number of selected trees within 50 to 100 feet of the outer boundary; may require up to 100% retention.
- Retain trees along previously unbuffered streams within the unit.



TYPE C Replaces Type A in units where helicopter yarding is required. Criteria for operator implementation are as follows:

- Retain sufficient structure to maintain 2.75 snags per acre over time. Selected trees and snags should consist of (1) mistletoe-free trees, (2) less merchantable or unmerchantable trees, and (3) pose no threat to safety.
- Retain selected trees and snags throughout unit.
- Helicopter yarding generally is required.



TYPE D Implement harvest according to Type A. Retain merchantable and nonmerchantable trees within the following zones through one or more of the following methods (specified in unit cards):

- Retain trees by increasing width of buffered streams within the unit.
- Retain trees by buffering any previously unbuffered streams within the unit.
- Retain trees between yarding roads.
- Retain tree islands or fingers where there are rock outcrops, slope, karst soils, or wetland concerns.
- Retain trees behind identified blind leads.
- Retain trees within and adjacent to unit boundary.

LEGEND:

Merchantable Reserve Trees | Blind Lead | Stream
Non-merchantable Reserve Trees | Yarding Roads

- *Type B* modifies Type A by also retaining a prescribed number of merchantable green tree replacements within specified species and/or diameter class limits. This harvest type is used to provide additional structure and to feather unit edges as a means of absorbing wind energy, or for visual concerns. Approximately 10 percent crown cover and an estimated 5 percent merchantable volume will be left in the unit.
- *Type C* retention leaves unmerchantable trees and snags over the entire unit. This treatment will be most applicable to helicopter yarding and approximately 5 percent crown cover will be retained.
- *Type D* leaves islands or strips of merchantable and unmerchantable reserve trees within the unit, around important resource features, behind topographic breaks, and between harvest settings. The merchantable volume in the unit left unharvested will vary depending on the number and size of the selected patches or clumps. The islands are typically prescribed for 2-5 acres with 100 percent retention within.

Leave tree islands may be used for the following reasons: 1) it is desirable to maintain an additional seed source for selected species, to maintain or promote species diversity within the future stand; 2) it is desirable to retain clumps of overstory conifers in the unit to mitigate visual concerns and/or to serve as islands of structural diversity throughout the next rotation; 3) retention of trees in clumps may help reduce windthrow; 4) they extend the effective zone of other leave tree areas such as TTRA stream buffers; and 5) they maintains understory vegetation as a source of vascular plant reinvasion.

Shelterwood

Shelterwood cutting is the practice of harvesting an area with a series of two or more removals over a period of time to ensure regenerative success. This system provides seed for natural regeneration and protects the seedlings from extreme heat and frost conditions. This system can also be used to mitigate wildlife and visual concerns; however, typically it includes the removal of the trees left for shelter as soon as restocking requirements are met. The overstory stand may be retained for a longer time period, perhaps indefinitely, when other resource concerns dictate.

Silvicultural advantages of shelterwood harvests include: 1) better control of species composition, and distribution, due to more abundant seed sources; and 2) more control over site conditions, such as frost pockets, and therefore regenerative success.

Some disadvantages of the shelterwood system include: 1) increased logging costs due to a repeat entry, and the care required to prevent excessive damage; 2) damage may occur to the residual stand and reproduction during logging; 3) overstocking of hemlock may occur due to the species shade tolerance; and 4) increased risk of blowdown to the residual stand between entries.

For the Lab Bay Project, two levels of retention are prescribed within the shelterwood harvest system. *Type G* shelterwoods will leave a minimum of 60 to 80 square feet of BA/acre with 30 percent crown cover. An estimated 30 percent of the merchantable volume will be retained across the unit. A minimum of 30 percent of the basal area is left to provide some windthrow resistance. *Type H* will leave 80 to 100 square feet of BA/acre and 50 percent crown cover. An estimated 50 percent of the merchantable volume will be retained. Most shelterwoods are prescribed within visually sensitive areas to meet partial retention visual quality objectives (TLMP Draft Revision 1991a).

Seed Tree

Seed-tree cutting is the practice of removing most trees from an area while leaving a few trees standing as a source of seed for natural regeneration. The seed trees provide future stand structural diversity if not removed as they are in a shelterwood system. The typical seed-tree prescription within the Lab Bay Project may leave a minimum of 6 to 12 trees/acre in order to meet visual and wildlife objectives. Retention of cedars will be emphasized.

Silvicultural advantages of the seed-tree system (vs. clearcutting) include: 1) better control of species composition and distribution, due to a more abundant seed source; 2) can regenerate extensive areas too large to be seeded naturally from adjacent stands; and 3) logging costs are minimal.

Some disadvantages of the seed-tree system include: 1) windfirm trees are needed because of an increased risk of blowdown; and 2) it is costly when seed trees are removed (volume recovery per area), and subsequent damage occurs to the regeneration.

Overstory Removal

The overstory removal system is used when a two-storied stand is present and the understory is healthy and shows good growth potential. It involves removing the larger trees that comprise the overstory canopy. By removing the overstory, more nutrients and sunlight reach the remaining stand, allowing it to grow to maturity. For the Lab Bay Project, an estimated 10 percent of the merchantable volume will be retained.

Selection of a particular unit for overstory removal is based on several factors: 1) there should be a distinct two-storied stand component in which the understory is of a submerchantable or small sawtimber size; 2) the topography of the site would not restrict the use of logging equipment necessary for this type of harvesting operation; and 3) there is enough merchantable volume present in the overstory to make the harvesting operation feasible. This system can be designed using strip cuts or patch cuts if appropriate harvesting equipment is used.

Some disadvantages of the overstory removal system include: 1) higher logging costs and greater care required during the logging process to prevent damaging the residual stand; and 2) shade tolerant understory species may not be desired species.

Uneven-aged Systems

Uneven-aged management can occur at both the stand and landscape level. At the stand level individual or small groups of trees are selected for harvest from all size and age classes. Group selection system is more commonly used for logging efficiency and safety, and to promote regeneration of shade intolerant species. The uneven-aged management plan proposed for Thorne Island under Alternatives 4 and 6 is a landscape level plan designed to produce a mosaic of age classes distributed across the island at the end of the rotation. (See Appendix E for more detail on the Thorne Island Uneven-aged Management Plan).

Uneven-aged systems produce stands of high structural diversity because of the intermingling of the different size and age classes. Uneven-aged silvicultural practices include both single tree and group tree selection.

Some advantages of uneven-aged systems include: 1) easy reproduction of shade tolerant species; 2) good seedbed protection with less adverse exposure caused by climate, sunlight or wind; and 3) increased diversity due to temporary increases in shade intolerant plants in the small openings.

Some disadvantages of uneven-aged systems include: 1) sale layout and administration requires highly skilled people; 2) logging costs are usually higher and greater care is required in the logging process due to higher risks of damage to the residual stand; 3) shade tolerant hemlock would eventually replace spruce and cedar species; and 4) it is not suitable for stands infected with dwarf-mistletoe.

The Thorne Island uneven-aged management plan has been designed so that the disadvantages generally associated with uneven-aged systems are reduced. Sale layout and logging costs for the Thorne Island uneven-aged management plan are expected to be less than the conventional plan due to the absence of road design requirements and road construction. However, due to the reliance on helicopter yarding, the Thorne Island uneven-aged management plan is more dependent on the market conditions at the time of sale than other offerings in the Project Area. The establishment of hemlock, spruce, and cedar species is expected to occur, as the 2-acre group selection openings are large enough to allow sunlight to reach the forest floor.

Single Tree and Group Selection

Individual tree selection removes selected trees of all age classes on an individual basis distributed throughout the stand. Group tree selection involves the removal of a small groups (usually about 2 acres) of trees in a stand and creates a mosaic of even-aged groups.

Where two-or three-storied stands exist, or where there are high elevation regeneration concerns, the single tree selection method was chosen to harvest individual mature trees. Any opening will restock with coniferous natural regeneration under the protection of the main canopy. Special care is required when logging to protect the residual stand.

A typical prescription for uneven-aged units, excluding those on Thorne Island, is designed to meet visual quality, wildlife, and regeneration objectives. These prescriptions will leave an estimated 40 to 75 percent of the merchantable volume depending on unit size and resource objectives. A combination of these two harvesting methods can be used in many of the proposed helicopter logging units to fulfill uneven-aged management objectives; however, the group selection harvest system is the primary method proposed for units in the Lab Bay Project Area.

Effects of the Alternatives

This section describes the potential direct and indirect effects on timber and vegetation resources from implementation of an action alternative. Timber harvest activities on the Tongass National Forest are strictly governed by federal and state law, and Forest Plan standards and guidelines designed to minimize detrimental effects to other resources.

Direct Effects

Direct environmental effects are those occurring at the same time and place as the result of implementing of one of the timber harvest action alternatives.

Forest Plant Communities

Timber harvest activities would influence forested plant communities by converting them to earlier successional stages. Harvesting would not change the potential climax community that can be achieved on a particular site. Because climax communities are based on climate, geology, and soils of the area, the effect of unit harvest upon the existing plant association series would be negligible. The exception to this is the removal of land area from the productive base due to road construction activities. Harvest activities would have little effect on nonforested plant communities, except where road segments cross nonforested cover types. Table 3-56 identifies the proposed harvest by plant community and alternative.

Table 3-56

Acres of Proposed Harvest by Plant Community and Alternative

Plant Community	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Western Hemlock Series	0	1,058	539	624	760	234
Sitka Spruce Series	0	15	11	9	5	11
Mixed Conifer Series	0	2,417	1,866	1,867	1,435	1,200
Mountain Hemlock Series	0	125	88	38	123	10
W. Hemlock/Yellowcedar Series	0	93	36	93	84	48
W. Hemlock/Redcedar Series	0	840	499	287	699	382
Total	**0**	**4,549**	**3,040**	**2,919**	**3,106**	**1,885**

Source: GIS Query, USDA Forest Service, TNF

Western hemlock branch with cones

Alternative 2 harvests the largest number of acres, while Alternatives 3, 4, and 5 harvest relatively the same number of acres of forested plant communities. Alternative 5 harvests a larger percentage of the western hemlock and western hemlock/redcedar series and a lower percentage of the mixed conifer series than the other action alternatives.

Table 3-57 identifies the miles of proposed and reconstructed road segments that would cross plant communities.

Table 3-57
Miles of Proposed and Reconstructed Road Across Plant Communities

Plant Communities	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Western Hemlock Series	0	20.6	10.2	9.0	13.2	3.7
Sitka Spruce Series	0	0.4	0.0	0.4	0.1	0.0
Mixed Conifer Series	0	48.2	36.0	32.3	31.6	18.8
Mountain Hemlock Series	0	4.8	4.2	2.0	4.0	2.5
W. Hemlock/Yellowcedar Series	0	1.1	0.4	1.1	1.1	0.9
W. Hemlock/Redcedar Series	0	10.4	7.8	5.4	9.5	6.6
Alder Shrublands	0	0.2	0.2	0.2	0.0	0.2
Landslide	0	0.2	0.0	0.2	0.2	0.0
Total	**0**	**85.8**	**58.9**	**50.4**	**59.7**	**32.7**

Source: GIS Query, USDA Forest Service, TNF

Approximately 55 to 65 percent of all roads proposed for construction and reconstruction occur within the mixed conifer plant association series.

Timber Classifications

Volume Class

The number of acres proposed for harvest in each Volume Class is shown by alternative in Table 3-58. This table provides an overview of the distribution of Volume Classes proposed for harvest. Additional information on the proposed Volume Class harvest and the percent of the existing Volume Class acreage that would be harvested by VCU is provided in Appendix D.

Table 3-58
Proposed Harvest of Volume Class Acres by Alternative

Volume Class	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
VC4	0	1,494	1,211	1,136	965	730
VC5	0	1,928	1,217	1,198	1,315	847
VC6	0	552	225	227	469	118
VC7	0	220	129	97	89	12
Undesignated	0	355	258	261	270	178
Total	**0**	**4,549**	**3,040**	**2,919**	**3,106**	**1,885**

Source: Ketchikan Area GIS

Site Class

In general, low site class lands produce lower volumes of timber per acre over a given time period than do high site class lands. It is economically more feasible to harvest the sites with the higher productivity rating. Because there are a range of other factors to consider when establishing harvesting priorities, harvest units are generally distributed across a range of productivity classes.

Estimates of site productivity in Southeast Alaska old-growth stands can be best obtained from an examination of the soil. Soil-site relationships have been developed.primarily upon depth and drainage of soil and parent material (Ruth and Harris 1979). Table 3-59 shows the level of harvest that would occur within each Site Class category for all alternatives.

Table 3-59

Proposed Harvest Acreage in Each Site Class by Alternative

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Very Low (0-40 Site Index)	0	188	142	94	165	57
Low (41-60 Site Index)	0	2,226	1,685	1,722	1,354	1,064
Medium (61-80 Site Index)	0	824	610	457	525	339
High (> 80 Site Index)	0	1,311	603	646	1,063	425
Total	**0**	**4,549**	**3,040**	**2,919**	**3,106**	**1,885**

Source: GIS Query, USDA Forest Service, TNF

In all action alternatives, 38 to 51 percent of the harvest is proposed from sites of medium and high productivity. The area within low productivity site classes currently makes up 49 to 53 percent of the proposed harvest for Alternatives 2 and 5. Over 60 percent of the proposed harvest for Alternatives 3, 4, and 6 comes from low productivity classes.

Areas of very low site index are generally considered unproductive or not suitable to harvest. Field verification on many of the small areas mapped as low productivity within proposed harvest units has confirmed that these are productive sites and there are no regeneration concerns.

Proposed Harvest Volume

Table 3-60 displays an estimate of the total volume expected to be harvested for each alternative. These volumes have been calculated by applying the average volume per acre inventoried for each forest type/volume class strata to the acreage of each strata within a unit for the proposed alternatives. The volume has been adjusted for partial cut retention levels as described previously (Silvicultural Harvest Methods). Additional information on the calculation of harvest volume is provided in the Lab Bay Timber and Vegetation Resource Inventory Report (Boyce 1994).

Table 3-60
Proposed Harvest Volume by VCU and Alternative

			Total MBF Volume*			
VCU	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt.5	Alt. 6
527	0	5,485	0	2,232	5,485	0
528	0	3,150	2,513	1,719	1,431	2,513
529	0	12,114	10,008	7,396	1,761	5,351
530	0	6,944	1,203	6,670	3,449	1,203
531.1	0	7,526	758	3,261	3,366	0
532	0	4,175	1,997	1,997	4,175	674
533	0	17,522	16,155	7,006	17,522	9,472
534	0	2,799	1,941	2,799	2,799	2,799
534.1	0	1,682	1,682	1,682	1,682	0
535	0	2,043	2,043	2,043	2,043	2,043
536	0	2,797	1,529	1,944	415	0
537.1	0	537	537	537	537	537
538	0	1,394	739	1,394	0	0
539	0	3,843	1,302	3,843	2,439	2,659
540	0	3,048	3,048	3,048	1,169	2,702
551	0	8,156	8,156	3,565	8,156	3,565
Total Unit Volume	0	83,215	53,611	51,136	56,429	33,518
Right-of-Way Volume	0	18,107	12,144	10,609	12,906	6,547
Total Volume	**0**	**101,322**	**65,756**	**61,745**	**69,335**	**40,065**

Source: Ketchikan Area GIS, Boyce 1993

* Adjusted for retention, hidden defect and breakage utility

Proportionality Analysis

The Tongass Timber Reform Act (TTRA 1990) modified the Long-term Timber Sale Contracts in Alaska to "...eliminate the practice of harvesting a disproportionate amount of old-growth timber by limiting the volume harvested over the rotation in volume class 6 and 7,...". The Forest Service developed the procedures and implementation instructions for conducting proportionality analysis in January 1992. Current guidelines for conducting the proportionality analysis are found in Forest Service Sale Preparation Handbook 2409.18, R10 Supplement No. 2409.18-93-3, August 15, 1993. The calculation of proportionality is based on dividing the high volume class acres by the total volume class acres within a Management Area. The proportionality in a Management Area after timber harvest is compared with the proportionality calculated for December 1990 conditions to verify that TTRA is satisfied.

The current methodology for conducting proportionality analysis, based upon acres and the timber type map, has been called into question by an April 1994 court decision, Wildlife Society et al. v. Barton, J93-001 CV (D. Alaska). In response, the Forest Service has been evaluating alternatives to the timber type map for determining proportionality of harvest. Updated Forest Service Handbook guidelines are being developed as part of settlement discussions with the lawsuit parties. While updated guidelines are being developed, proportionality analysis will follow the implementation procedures in Forest Service Handbook 2409.18, R10 Supplement

Sitka spruce twigs with cones

No. 2409.18-93-3. For the Lab Bay analysis, the base proportions calculated using this method were used to evaluate compliance with the proportionality requirements.

The proportionality analysis for the Lab Bay Project Area is based on the boundaries for Management Areas K01, K02, and K03 prior to the passage of TTRA. The boundaries of these Management Areas have been changed subsequently. The VCU's that comprise each of the current Management Areas are shown in the legend of Figure 1-4. The pre-TTRA Management Area K02 includes the VCU's currently in K02, plus VCU's 534.0 and 534.1 from Management Area K01 and VCU 534.4 from Management Area K03.

Using the procedures outlined in the Forest Service Handbook, the proportion of Volume Classes 6 and 7 were calculated for Management Areas K01, K02, and K03. The change in proportionality from the base percentage of 1990, resulting from harvest activity since 1990, and the change from the 1990 base resulting from the subtraction of the proposed harvest acres for each alternative are displayed in Table 3-61. The base proportions presented here are different from that presented in the Forest Service Handbook. This difference is due to the use of project-specific information, updated GIS coverages for the Project Area, and an analysis based on polygon coverages rather than TLMP Draft Revision (1991a) point grid coverages. As such, it represents an incremental improvement to the accuracy of the proportion calculated in the Forest Service Handbook. Selection of Alternative 1 (No Action) would maintain the existing proportion identified as December 31, 1994 for K01 and K02.

In the following table, alternatives are within the required proportion if the "change from base" value is positive. If the "change from base" value is negative, the alternative is considered out of proportion.

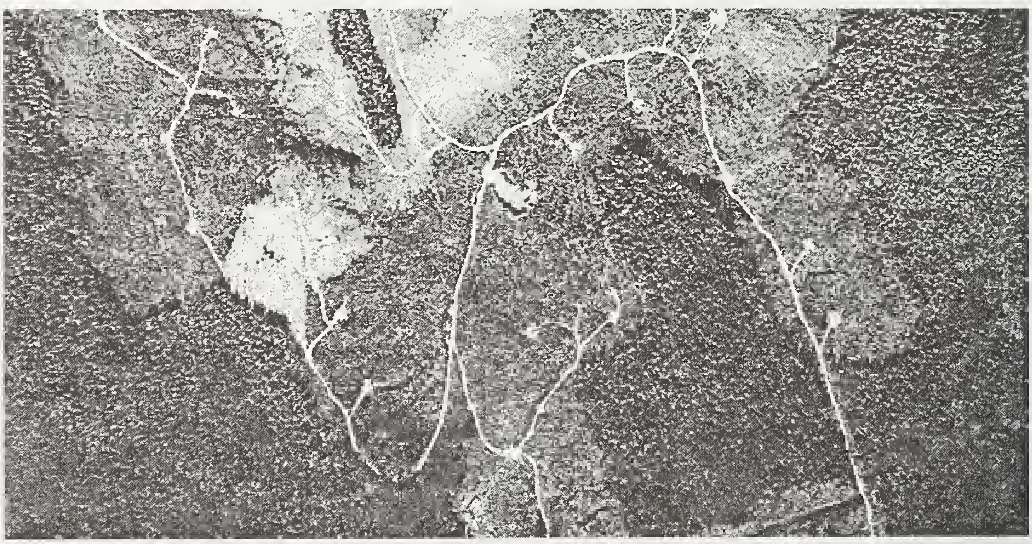


Table 3-61
Proportionality Analysis by Management Area

Time Period / Alt.	MA	Acres VC 4-7	Acres VC 6-7	Percent	Change from Base[1]
Dec. 31, 1990 (Base)	K01	32,101	11,960	37.26	
Dec. 31, 1994	K01	30,369	11,253	37.05	-0.20
Alt. 2	K01	2,101	761		
Result	K01	28,268	10,492	37.12	-0.14
Alt. 3	K01	1,369	349		
Result	K01	29,001	10,904	37.60	0.34
Alt. 4	K01	1,247	316		
Result	K01	29,122	10,937	37.56	0.30
Alt. 5	K01	1,446	554		
Result	K01	28,924	10,699	36.99	-0.27
Alt. 6	K01	894	130		
Result	K01	29,475	11,124	37.74	0.48
Dec. 31, 1990 (Base)	K02	7,140	1,663	23.29	
Dec. 31, 1994	K02	6,305	1,407	22.31	-0.98
Alt. 2	K02	227	0		
Result	K02	6,078	1,407	23.14	-0.14
Alt. 3	K02	182	0		
Result	K02	6,124	1,407	22.97	-0.31
Alt. 4	K02	227	0		
Result	K02	6,078	1,407	23.14	-0.14
Alt. 5	K02	227	0		
Result	K02	6,078	1,407	23.14	-0.14
Alt. 6	K02	155	0		
Result	K02	6,150	1,407	22.87	-0.41
Dec. 31, 1990 (Base)	K03[2]	39,592	7,213	18.22	
Dec. 31, 1994	K03	36,943	6,407	17.34	-0.87
CPOW Units	K03	321	0		
New Total	K03	36,622	6,407	17.50	-0.72
Alt. 2	K03	1,866	11		
Result	K03	34,756	6,397	18.40	0.19
Alt. 3	K03	1,231	4		
Result	K03	35,391	6,403	18.09	-0.13
Alt. 4	K03	1,184	7		
Result	K03	35,438	6,400	18.06	-0.16
Alt. 5	K03	1,164	3		
Result	K03	35,458	6,404	18.06	-0.16
Alt. 6	K03	690	0		
Result	K03	35,933	6,407	17.83	-0.39

Source: Ketchikan Area GIS

[1] Positive numbers reflect alternatives that are "in" proportion, negative numbers reflect alternatives that are "out" of proportion

[2] MA K03 is shared with Central Prince of Wales sale area (CPOW)

Western redcedar branch with cones

The results of the acreage-based proportionality analysis can be summarized by Management Area as follows:

- K01 is above the base proportion with the harvest of Alternatives 3, 4, and 6. K01 is below the base proportion under Alternatives 1, 2, and 5, yet is within the tolerance level of 0.5 percent allowed by the Forest Handbook. Alternative 2 improves the proportion of high volume in Management Area K01 compared to the existing conditions.
- K02 is below the base proportion under each alternative. Alternatives 2, 3, 4, 5, and 6 are within the 0.5 percent level of tolerance allowed by the Forest Handbook and they improve the Management Area proportion compared to existing conditions. No Volume Class 6 and 7 is proposed for harvest under any of the alternatives.
- K03 is below the base proportion under Alternatives 1, 3, 4, 5, and 6, but is within the 0.5 percent level of tolerance allowed by the Forest Handbook under Alternatives 3, 4, 5 and 6. Proposed harvest would improve the Management Area proportion compared to existing conditions. Up to 11 acres of Volume Class 6 and 7 is proposed for harvest in Management Area K03. This acreage is distributed between four harvest units.

For evaluation of proposed harvest alternatives, a 0.5 percent departure from the base proportion is allowed if there is an opportunity through future offerings to return to the base proportion by the end of the KPC Long-term Contract period. The table above shows that each Management Area drops below the base proportion under at least one alternative, yet is always within 0.5 percent of the base proportion under all action alternatives.

The following table shows the acres by Volume Class that would need to be harvested after implementation of an alternative, to return to the base proportion. For alternatives that are out of proportion (the "Change from Base" value was negative in the previous table), additional acres of Volume Class 4 and 5 would need to be harvested to return to the base proportion. For alternatives that are within proportion, the table below shows the additional acres of Volume Class 6 and 7 that could be harvested and remain within the required proportion.

Table 3-62

Acres Needed to be Harvested to Return to Base Proportion

	Acres	
Alternative	**VC 4-5**	**VC 6-7**
Management Area K01		
Alt. 1	167	
Alt. 2	108	
Alt. 3		158
Alt. 4		138
Alt. 5	208	
Alt. 6		226
Management Area K02		
Alt. 1	264	
Alt. 2	38	
Alt. 3	83	
Alt. 4	38	
Alt. 5	38	
Alt. 6	109	
Management Area K03		
Alt. 1	1,451	
Alt. 2		79
Alt. 3	244	
Alt. 4	309	
Alt. 5	306	
Alt. 6	762	

Source: Ketchikan Area GIS

Proposed Harvest by Silvicultural System

The existing successional stage will be altered by the proposed silvicultural treatments. Even-aged cutting practices will result in the conversion of mature and overmature stands to seedling stands. This process would occur on all sites except those that are proposed for uneven-aged management or overstory removal. Overstory removals convert the existing stand to an immature stand. The post-harvest successional stage, for all harvest types, especially uneven-aged treatments, will be dependent upon the plant community, the retained canopy structure (harvest design), and advance regeneration.

Species composition will change from an existing condition to a managed condition. The future condition on some sites is expected to include fewer cedar. Studies indicate that other conifer species can outcompete the cedars on sites which are most preferred by cedar (USDA Forest Service 1992h). Other sites may produce higher amounts of understory vegetation which can also affect species composition, seedling survival, and growth.

Table 3-63 summarizes the proposed harvest methods for all alternatives. The number of units using each system (some units use 2 or more systems) are shown along with the total number of acres in the alternative. Depending on the alternative, 18 to 23 percent of all acres proposed for harvest will use silvicultural systems other than clearcutting.

Table 3-63
Proposed Harvest by Silvicultural System and Alternative

	Alt. 1		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6	
	Units	Acres	Units	Acres	Units	Acres	Units	Acres	Units	Acres	Units	Acres
Clearcut												
Type A	0	0	19	417	16	359	12	274	14	302	8	160
Type B	0	0	37	1,225	29	953	24	787	21	736	18	607
Type C	0	0	5	179	2	119	5	360[1]	2	93	2	282[1]
Type D	0	0	45	1,680	25	1,048	27	911	33	1,279	15	503
Total Clearcut[2]	**0**	**0**	**94**	**3,502**	**65**	**2,479**	**61**	**2,332**	**63**	**2,409**	**38**	**1,553**
Overstory Removal	0	0	8	202	6	111	4	148	8	202	6	177
Seed Tree	0	0	8	205	7	188	8	205	5	154	4	94
Shelterwood	0	0	5	169	5	169	3	80	3	98	1	9
Shelterwood	0	0	2	23	0	0	1	2	2	23	0	0
Group/Single Tree Selection	0	0	17	449	5	92	5	151	12	221	3	53
Alternative Total[2]	**0**	**0**	**125**	**4,549**	**83**	**3,040**	**79**	**2,919**	**85**	**3,106**	**47**	**1,885**

Source: Ketchikan Area GIS

[1] Includes 218 acres of individual patch cuts on Thorne Island as part of the uneven-aged management plan.

[2] Number of units is cumulative.

An Uneven-aged Management Plan for Thorne Island is incorporated into Alternative 4 and 6. This plan proposes harvesting approximately 109 two-acre (average) patches within the suitable forestland on the island. Re-entries are scheduled every 15 years on a sustained basis through time. The interior suitable area is scheduled for harvest on a 150-year rotation, while beach fringe and HCA areas are scheduled on a 195-year rotation. The silvicultural system used

within the individual patches will be based upon harvest Type C with an additional 2 trees per acre, greater than 15 inches dbh retained within the patch. This plan is designed to provide timber volume while maintaining a functional old-growth ecosystem with emphasis on visual quality and wildlife habitat. Additional information on the proposed Thorne Island Uneven-aged Management Plan is provided in Appendix E.

Proposed Harvest Unit Size

The National Forest Management Act of 1976 (NFMA) limits the size of a forest opening that may be created based on the forest type. For the coastal Alaska western hemlock/Sitka spruce forest type, the maximum created opening size is 100 acres. Under the NFMA, the opening size may be extended to 150 acres under certain conditions with the approval of the Forest Supervisor. The NFMA and the Alaska Regional Guide (USDA Forest Service 1983) provide the following guidelines to be considered for permitting a larger unit size.

1) Topography;
2) Relationship of units to other natural or artificial openings and proximity of units;
3) Coordination and consistency with adjacent management areas;
4) Effect on water quality and quantity;
5) Visual absorption capacity;
6) Effect on wildlife and fish habitat;
7) Regeneration requirements for desirable tree species, based upon latest research;
8) Transportation and harvesting system requirements;
9) Natural and biological hazards to the survival of residual trees and surrounding areas;
10) Relative total costs of preparation, logging, and administration of harvest units.

The Alaska Regional Guide also describes the minimum stocking guidelines required in order to change the opening status of a harvested unit. Created openings will be adequately stocked with desirable tree species of specified height before the area will no longer be considered an opening. This requirement will affect the limitations on scheduling, locations, and size of additional created openings on National Forest System lands. The basis for this determination will be the third year silvicultural survey.

The pool of potential harvest units for Lab Bay contains two units greater than 100 acres (Table 3-64). Mitigation measures have been prescribed for these units to reduce the size of the created opening to less than 100 acres. Mitigation includes adjustment to unit boundaries, selective harvest over part of the unit, or retaining buffer strips to reduce the effective size of the created opening to approximately 100 acres.

Table 3-64
Units Greater than 100 Acres

Alternatives	Unit #	Unit Acres	Mitigation Measure	Approx. Opening Size
2, 3	529-270	109	Clearcut Type D harvest within entire unit (retains groups)	92 Acres
2, 3, 5	533-201	119	Clearcut Type D harvest within 94 acres of unit	100 Acres

Source: Ketchikan Area GIS

Indirect Effects

Successional Stages and Associated Stand Management

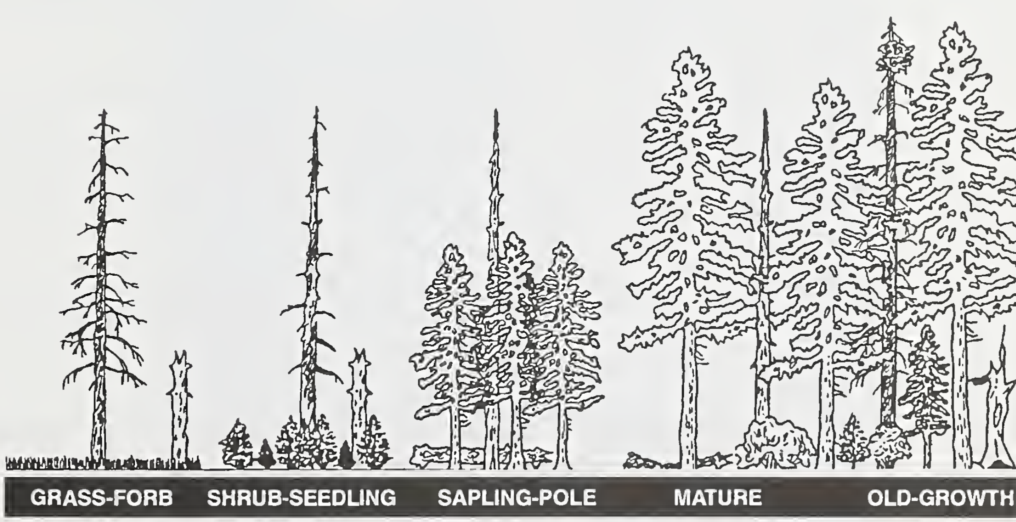
Following harvest, the forest goes through distinctive successional stages. Different species dominate the stand at different stages, and the overall forest structure changes over time as the new stand develops. The level of change depends on the silvicultural treatment type, including retention level, applied during harvest, and subsequent treatments applied during stand development. Characteristics such as tree height, diameter, and overall stand productivity vary according to site class. Second-growth stands commonly show less variability in tree diameter and height than the old-growth stands they are replacing. The following stages are generally applicable to even-aged treatment types.

Conifer Regeneration Stage (0-5 years)

A variety of shrubs, herbs and grasses dominate the site during this period. These species invade favorable microsites in the first growing season following harvest. Species adapted to increased solar radiation outcompete those adapted to lower light levels (shade tolerant). Conifer seedling establishment is dependent upon microsites favorable to each particular species. Conifer growth may be slow on sites where salmonberry, alder or other invading species are present. Understory development increases along the edge of adjacent stands because of the additional sunlight reaching to those areas.

Species that thrive in the shaded and protected environment of the mature forest, such as some mosses, lichens, forbs, and shrubs, would likely have a reduced presence in the new stand. Other species such as huckleberry, salmonberry, and western hemlock survive as understory species, but become vigorous competitors for space when the canopy is removed and additional light is available.

Hemlock generally is the dominant conifer species to become established because its shade tolerant and competitive characteristics usually lead to good seedling establishment. Sitka spruce regeneration more commonly occurs and develops rapidly from seed in open sunlight conditions. Cedar is not expected to be a significant component of the new stands. Western red cedar and Alaska yellowcedar germinate well on mineral soil, but are the poorest competitors for establishment among local conifer species. Greater cedar regeneration may occur on sites with a high cedar composition prior to harvest, or sites which have retained cedar advanced regeneration or seed trees during harvest. Western red cedar is favored on warmer sites with longer growing seasons, where Alaska yellowcedar is favored on cooler sites with a shorter growing season.



The number of seedlings established per acre at the end of this stage is determined by seed availability and the number of microsites favorable for seedling establishment. The number of seedlings established could range from several hundred to several thousand per acre.

Where nonmerchantable trees are retained in a unit, the level of retention controls the overall appearance of the site. Groups of smaller diameter understory trees may be retained in areas for wildlife or visual protection. Depending on the number of trees retained, these sites can have the appearance of a partial cut. The retained trees provide some diversity in forest structure throughout the life of the next stand.

Seedling/Sapling Stage (6-25 years)

Understory production of woody species is at its highest at this stage, especially in *Vaccinium*-dominated sites. Larger dead material from the original stand continues to decompose. If the stocking level is high and the site is productive, initiation of conifer crown closure occurs. The initiation of crown closure is dependent upon the number of trees established per acre during the first (0-5 year) stage. Management recommendations suggest implementing a precommercial thinning near the end of this stage because competition for growing space begins to reduce growth rates.

On productive sites, such as a western hemlock/shield fern plant association, crown closure occurs during the mid-to late-portion of this stage. If precommercial thinning is not undertaken, this results in a decline of shade intolerant shrubs, herbs, and grasses, and conversely a gradual increase in the proportion of shade tolerant understory species. If the stand is precommercially thinned, the shade intolerant shrub species would be retained until crown closure occurs midway through the next stage. On lower quality sites, crown closure may not occur until the very end of this stage or possibly the beginning of the next stage.

Management guidelines on the Thorne Bay Ranger District recommend that spruce and cedar species be given preference when selecting species to retain during thinning. This selection process results in reducing the stocking level of hemlock by a larger percentage than other species in the stand.

Pole/Young Sawtimber Stage (26-50 years)

Tree growth during this stage is characterized by accelerated height and crown growth. Crown closure would be completed for most site classes and forest types. This stage is often referred to as the understory exclusion stage because understory vegetation decreases as closure occurs. The overstory structure generally remains uniform across the stand.

When stands have been precommercially thinned, they may provide winter habitat for deer. This is because the delay in crown closure enables understory forage to persist and the larger diameter conifer branches produced after thinning hold greater amounts of snow in the canopy, providing increased thermal cover.

If these stands have not been precommercially thinned, there would be less understory vegetation present. The appearance of the overstory canopy structure depends upon the quantity and placement of retained merchantable or nonmerchantable trees within the stand. Increased competition for growing space begins leading to suppression of trees under the main canopy and some natural mortality.

Crown closure may not occur in all types of stands. The low volume Hemlock-Cedar and the Mixed Conifer plant associations will often retain an open crown structure throughout the rotation.

Young Sawtimber Stage (51-100 years)

For most forest types, this stage is dominated by crown and height differentiation with increased stand volume growth. Less vigorous trees are overtopped by superior trees, creating an overstory canopy with more depth. Suppressed trees continue to die in the understory canopy allowing adjacent trees to use the light and nutrients made available.

Mosses begin to colonize the forest floor as the type of understory shrubs present is reduced to shade tolerant species. Occasional openings may be created in the overstory through windthrow or individual tree mortality. This provides some additional light to the forest floor to retain patchy shrub growth. The appearance of the overstory canopy structure is dependent upon the quantity and placement of retained merchantable or nonmerchantable trees within the stand. Retention trees assist the stand in developing old-growth characteristics at a younger age.

Depending on site quality and stocking level, tree growth begins to slow towards the end of this stage. Opportunities exist early in this stage to commercially thin the stand and concentrate growth on fewer trees. If the stand is not thinned, diameter, height, and growth rates may decrease. Regeneration harvest in the Lab Bay Project Area typically would occur at the end of this stage, at about 100 to 120 years of age.

Commercial thinning during this stage can provide a flow of harvest volume, while providing benefits such as increased growth, species and structural control, and windfirmness. A variety of techniques may be used to prepare the stand for future treatment or desired habitat conditions, particularly for wildlife.

Mature Sawtimber Stage (100-250 years)

At this stage, the mature stand structure created in the previous stage becomes more diverse. The stand begins to develop the structural characteristics usually associated with old-growth stands. Mortality among trees in the overstory begins to occur, leaving small openings. This allows light to reach the forest floor and helps in the establishment of understory vegetation, including conifer seedlings. The stand slows in growth and vigor but still produces higher volumes per acre than the previous stages. Trees that have been retained from the previous regeneration harvest no longer dominate the overstory. Structural diversity increases in both the understory and overstory, and is greater than at any previous stage.

Commercial forest stands in the Lab Bay Project Area generally would reach this stage only if stands are harvested under extended rotation management. There are currently some young, previously harvested stands that will mature to this stage. These are stands that were harvested near Hole-in-the-Wall that are now included as part of the Mt. Calder/Mt. Holbrook LUD II area. In addition, previously harvested sites in some areas are now protected from future harvest by their inclusion within No Commercial (TTRA) and No Programmed Harvest stream buffers, Special Interest Areas, and Beach Fringe & Estuary buffers.

The overall effect of timber harvest on forest health would be to reduce the number of stands with slow or declining growth rates caused by general decay and hemlock dwarf mistletoe. Harvesting stands in declining health and replacing them with young vigorous stands would reduce the volume loss associated with decay and would increase the growth and yield of the managed forestland across all action alternatives. From the perspective of timber management, the health of the timber stands is usually increased through harvesting. Many insects and pathogens also contribute significantly to ecosystem diversity and long-term stability in old-growth stands by providing increased canopy diversity and animal habitat in the form of snags and small openings.

Harvest of the proposed unit pool would have no measurable effect upon the overall forest pest populations. Epidemic outbreaks are normally independent of timber harvest. Although partial cutting activities may benefit stand health in the form of stocking control, it could be negated through basal damage if preventive care is not taken during logging operations.

Dwarf Mistletoe

Management and control of dwarf mistletoe includes removal of infected trees through clearcutting. Regeneration in previously clearcut harvested areas appears to be generally free of mistletoe, although it usually takes 10 years before mistletoe becomes evident in young stands. Mistletoe spreads slowly to regenerated stands from adjacent infected stands. Controlling the spread and reducing the impacts of mistletoe on timber production is usually accomplished through intermediate treatments favoring species that are resistant to mistletoe. Generally, there is little volume loss throughout the rotation if the stand does not suffer growth losses from heavy infection at an early age. Thinning treatments can be used to reduce the presence of mistletoe in the stand.

The total acreage of mistletoe-infected stands would be reduced by harvesting currently infected stands. However, the spread of dwarf mistletoe into young hemlock stands is most often the result of leaving infected hemlock standing within and adjacent to cutover areas (Shaw 1982). Rates of spread would be greater in partially cut stands where infected western hemlock have been retained. Stands that are infected with mistletoe and would benefit from being harvested can be identified from the unit cards (Planning Record).

General Decays

Both western hemlock and spruce are thin-barked species and very susceptible to damage from logging activity. Although the proposed harvest is not expected to result in an increase in stem and root decays, partial cutting or thinning practices can increase the presence of decays if species selection criteria and/or careful logging practices are not accomplished. If significant numbers of trees are damaged during harvest activities, the damaged trees should be harvested within 5 to 10 years, to minimize loss of merchantable volume due to decaying organisms. Planting tree species resistant to specific root decays can be used to control root decay pathogens within a stand.

Western Hemlock Canker

The presence of western hemlock canker can be expected to increase slightly with the increased development of roads and vehicle traffic within the Project Area. The presence of this pathogen and its dispersal has been attributed to gravel roads with high vehicular traffic. The damage associated with this pathogen is primarily restricted to the lower branches of western hemlock trees within 100 feet of the roads, although in some areas, such as Unit 537.1-208, the distance from the road that the infection has been found is increasing. This results in a loss of visual quality adjacent to the road. Western hemlock canker may cause regeneration mortality, although the cankers' influence on the growth of young stands is not well documented.

Hemlock Fluting & Yellowcedar Decline

Harvest within the Lab Bay Area is not expected to change the presence or spread of hemlock fluting or yellowcedar decline. Studies have not shown that these forest pathogens are influenced by the presence or type of harvest that is expected to occur; however, the regeneration of Alaska yellowcedar is addressed where it forms a significant component of a site proposed for harvest. The harvesting of old-growth forests through large clearcuts has in the past resulted in a reduction of the yellowcedar component.

Windthrow

The potential for windthrow increases throughout the Project Area as additional harvesting creates exposed stand edges. The strongest winds come from the southwest and southeast, therefore windthrow is most likely to occur in mature stands with uniform and dense crown structures along the north edge of clearcut units. Stands that are less susceptible to windthrow have developed an open canopy structure that allows individual trees to become windfirm in response to wind stress. Partial cutting techniques which remove less than 30 percent of the overstory leave stands in a more wind resistant condition than other silvicultural practices (Harris 1989).

Since windthrow is partially a random event, its occurrence, placement, and timing across the landscape is unpredictable. Localized conditions (soil, hydrology, or topography) were considered to predict potential windthrow within and adjacent to proposed harvest units. Local disruption of wind patterns would occur as the overstory canopy is opened during harvest. These changes are expected to occur immediately adjacent to harvest units, occasionally causing windthrow of standing trees. Wind patterns over larger areas are not expected to be affected as they are more influenced by topography and large-scale storm patterns. The issue of local wind pattern changes will be evaluated in a separate study prior to and during harvest proposed on Protection Head.

Reforestation

Natural regeneration will be used to restock all units harvested; however, cedar silviculture is problematic, and to be successful it will probably require a variety of techniques. Available data suggest that clearcutting will not consistently regenerate this species. Partial cutting may be more useful in maintaining cedar as a viable timber resource (USDA Forest Service 1992d).

Precommercial Thinning

Harvest practices within the Project Area during the past decades have been dominated by clearcutting and natural regeneration, often resulting in overstocked stands. Precommercial thinning is designed to improve future growth by reducing stand density, thus reducing the competition between trees for sunlight, moisture, and nutrients. The method for thinning any particular stand is based on the characteristics of the site and the resource objectives for the area. Thinning is classified as precommercial when there is no commercial wood use. This treatment would be performed on stands approximately 15 to 25 years of age . Depending on the objectives of the site (timber production, timber production and wildlife habitat, timber production and visual resources), criteria that could be used to identify and select existing second growth stands for precommercial thinning are the following:

1. High site productivity.
2. Average tree diameter less than 8 inches.
3. Crown closure between 50 and 80 percent.
4. Topography and access available for future commercial thinning using ground based or small cable yarding system.
5. Adjacent to proposed commercial harvest units where KV funding can be provided for timber stand improvement.

If the objectives of the thinning include wildlife habitat improvement, the thinning should be conducted before crown closure significantly reduces the understory shrub and forb production. This generally occurs at approximately 70 percent crown closure. Thinning should be completed at a wide spacing to allow for a long period of understory shrub production prior to canopy closure.

Cumulative Effects

Cumulative effects result from the incremental effect of an action when added to the past, present, and reasonably foreseeable future actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time. This section analyzes the cumulative effects of past harvest, harvest proposed under the Lab Bay sale, and estimated future harvest within the Project Area. Rates of future harvest and the amount of land available for harvest are difficult to predict accurately, due to changing economics and land use policies. For this analysis, future harvest estimates are based on TLMP (1979, as amended) projected harvest rates and acres scheduled for harvest. The relationship of these estimates to those contained in the new 1996 TLMP Draft Revision is discussed below.

The earliest commercial timber harvest on Prince of Wales Island was limited to easily accessible coastal shorelines. Development of the logging road system marked the beginning of intensive land-based efforts. Since 1940, approximately 34,210 acres of timber have been harvested in the Lab Bay Project Area.

Project Harvest Through 2004

Table 3-65 presents the cumulative acreage of old growth harvested within the Project Area by 1994. Depending on the alternative, cumulative harvest of old growth would increase between 0 (Alternative 1) and 4,549 (Alternative 2) acres, due to the Lab Bay Project. No additional harvest is scheduled through 2004 in the Project Area.

Table 3-65
Lab Bay Project Area Proposed Cumulative Timber Harvest

Alt.	Past Harvest 1940-1994	Proposed Lab Bay Project Harvest	Cumulative Harvest 1940-2004
1	34,210	0	34,210
2	34,210	4,549	38,759
3	34,210	3,040	37,250
4	34,210	2,919	37,129
5	34,210	3,106	37,316
6	34,210	1,885	36,095

Source: Ketchikan Area GIS

The predicted effect of harvest on the Lab Bay Project Area and future timber harvest activities on northern Prince of Wales Island would move toward the desired future condition for each LUD as described in the 1979 TLMP, as amended. Areas that allow timber harvest (LUD III and LUD IV) would be converted from overmature forests to various younger age classes.

Cumulative Harvest through 2054

Table 3-66 shows the acres of original and current old growth in the Project Area and the average annual projected harvest as scheduled in the Forest Plan (TLMP 1979, as amended).

Table 3-66
Projected Harvest Acres for the Lab Bay Project Area

	Acres	
Original Old Growth (1954)[1]	113,174	
Scheduled Acres Previously Harvested	(34,210)	
Current Old Growth (1994)[1]		78,964
Average Annual Harvest (1954-1994) = 855 Percent of Scheduled Acres Previously Harvested = 48%		
Scheduled Acres Remaining to be Harvested (TLMP 1979, as amended)[2]	(37,080)	
Old Growth Remaining at 2054[1]		41,884
Average Annual Projected Harvest = 618 Percent of Scheduled Acres Proposed for Harvest under the Lab Bay Sale (Alt. 2 and Alt. 6) = 3 - 6%		

Source: Ketchikan Area GIS Ketchikan Area Planning Section

1 Includes State, Private and Encumbered lands.

2 Adjusted for land ownership changes through May 1995.

The Lab Bay project proposes to harvest between 3 percent (Alternative 6) and 6 percent (Alternative 2) of the Forest Plan scheduled acres (TLMP 1979, as amended). This harvest will add to the 48 percent of the scheduled acres that have been previously harvested in the Lab Bay Project Area.

The 41,884 acres of old growth projected to remain in the year 2054 consists of several components. The largest components are the Salmon Bay and Mt. Calder/Mt. Holbrook LUD II areas and the scheduled old growth retention areas. The smaller components include encumbered lands, TTRA stream buffers, and steep slopes with a very high mass movement index. Additional areas that would be available to harvest, but were not scheduled for harvest in the Forest Plan, include 50 percent of the scheduled extended rotation areas, and 67 percent of the non-standard operable forestland areas.

Timber Supply

Table 3-66 indicates that approximately 37,080 acres of commercial forestland are scheduled for harvest between now and the year 2054. This includes the acreage to be harvested under the Lab Bay Sale, which varies under the action alternatives from 1,885 (Alternative 6) to 4,549 (Alternative 2) acres. It is estimated, based on TLMP (1979, as amended) numbers updated for current land ownership, that harvest will occur at a rate of approximately 618 acres per year. The projected harvest reflects the Lab Bay Project Area's estimated contribution to an average Annual Sale Quantity (ASQ) of approximately 450 MMBF for the Tongass National Forest (TLMP 1979, as amended).

Since 1979, additional land use interests and resource information have influenced Forest Service management direction. Road building associated with timber harvest has led to increased levels of State selection of land for residential communities, removing these lands from the National Forest System. Increased access has also led to increased demand for recreational opportunities, including both developed and undeveloped settings. Increased knowledge of the

effects of management activities has led to changes in Standards and Guidelines and Best Management Practices in order to protect valuable fisheries, wildlife and forest resources. The actual rate and acres of future harvest are expected to vary from the estimate provided above due to the additional multiple use demands on, and increased natural resource knowledge of, the Forest System land base.

The difference between Forest Plan scheduled harvest and that which is attained after implementation is referred to as falldown. Examples of falldown include local areas of poor soil stability, rock outcrops, v-notches, noncommercial forest sites, and sites that cannot be reforested in five years. Falldown also includes lands required for buffers along previously unmapped streams and lands selected by the State or Native Corporations that have been conveyed to their ownership.

Deferral of harvest is also considered falldown, including deferral of 1) units adjacent to previous harvest areas that have not reached sufficient regeneration height to meet NFMA created opening requirements; 2) units in watersheds that have exceeded proposed Forest-wide standards and guidelines for cumulative effects; 3) and deferral of units to meet TTRA proportional harvest requirements. Selection of harvest types other than clearcut also leads to falldown, as merchantable timber may be retained within the unit to meet non-timber resource objectives. Falldown due to economic factors occurs when suitable lands are deferred from harvest due to low cost effectiveness, for example lands that require many miles of new road construction or expensive logging systems such as helicopter.

Emerging land use issues also have the potential to affect future timber supply. This may include deferral of units to meet newly updated resource objectives or maintain options for developing Forest Plan direction. Examples of this are in the draft interim standards and guidelines for the protection of karst resources and for Habitat Conservation Areas. Deferrals to maintain options for proposed guidelines provide protection for the resources while long-term management policies are developed, evaluated, and incorporated into the forest planning and implementation process.

In order to more closely estimate potential falldown and change in land use factors, the Ketchikan Area, in association with the Control Lake EIS, recently updated several resource databases. Stream databases were updated to better represent conditions found during ground verification and project implementation. Additional analysis of slopes, landslides, and V-notches in conjunction with soils was performed to help identify areas that often are inoperable for logging. Logging and transportation analysis for future projects was performed to quantify how much of the suitable timber base is in the more expensive economic category. Karst vulnerability rating was performed to quantify the potential effects on timber supply of managing these resources. The Ketchikan Area Update was designed specifically to help address the areas of potential changes in timber supply discussed above and is expected to provide more precision to the quantification of potential falldown and changes in land use. For specific examples of falldown and changes in land use affecting the Lab Bay Sale, refer to the Lab Bay Draft EIS.

1996 TLMP Draft Revision

Both falldown and changes in land use can affect the timber harvest rates established in the Forest Plan. Because these factors occur at the Administrative Area and Forest-wide level, as well as the project level, they cannot be completely addressed within a project-level EIS. As shown in Table 3-66, the Lab Bay sale will contribute a small proportion (approximately 3 to 6 percent) of the TLMP 1979 scheduled harvest for the Project Area. The issue of timber supply across a broader regional area must be addressed at the Forest Plan level.

The National Forest Management Act regulations require that Forest plans be revised on a 10 to 15 year cycle to adapt to changing public views, resource uses and demand, and natural resource knowledge. The Forest planning process is used to address resource issues, land use demands, and changing land use policies. Such changes are then reflected in the acres and Allowable Sale Quantity available for harvest in the future.

The 1996 TLMP Draft Revision (USDA Forest Service 1996) addresses in detail the issues of long term timber supply, sustainability, and effects to community stability. New estimates of timber supply are included, reflecting analysis of falldown factors, changes in land use planning, and economic considerations. Specifically, the 1996 TLMP Draft Revision incorporates the Ketchikan Area Update. This update reflects new information about streams, slopes, soils, and operability ratings as well as karst vulnerability ratings. New Land Use Designations and Conservation Biology Strategies are also incorporated in the 1996 TLMP Draft Revision. Future harvest projected in the 1996 TLMP Draft Revision reflects adjustments for various types of falldown factors based on recent field investigations for timber sale EIS's, including adjustments for alternative, non-clearcutting harvest methods. The 1996 TLMP Draft Revision presents the best available assessment of future timber supply for the Project Area and the Tongass National Forest as a whole. The Revision is scheduled for completion later in 1996.

Monitoring

The Forest Plan recognizes three distinct types of monitoring: implementation, effectiveness, and validation. Implementation monitoring determines if projects and activities comply with Forest Plan standards and guidelines. Effectiveness monitoring determines whether the standards and guidelines achieve the desired results. Validation monitoring determines whether the assumptions in the Forest Plan regarding the relationship between management actions and their effects are correct, or if there is a better way to depict these relationships.

A monitoring plan has been developed for the Tongass National Forest by the Forest Planning Team and is described in the TLMP Draft Revision (1991a). The Lab Bay Project Area will contribute towards meeting overall Forest Plan monitoring goals through the selection of proposed harvest units/roads for monitoring. Recommendations for monitoring timber resources for the Lab Bay Project Area have been documented in the Timber and Vegetation Resource Report (Boyce 1994) and the project Planning Record.

Project-specific monitoring that is unique to the Lab Bay Project Area, and that would not be included in regular Forest Plan or routine implementation monitoring, has been identified for several resources. Silviculture, timber, and vegetation resources are included in project-specific monitoring for the Thorne Island uneven-aged management plan and ecosystem management. These monitoring activities are described in Chapter 2.

Wildlife, Old Growth, and Biodiversity

Key Terms

Biological Diversity - The diversity of life in all its forms and all its level of organization characterized by elements including composition, function, and genetic variability.

Cavity Excavator - An animal that constructs cavities in trees for nesting or roosting.

Cover - Vegetation used by wildlife for protection from predators, or from adverse weather conditions, or in which to reproduce. The different types are identified as hiding cover, thermal cover, and security areas.

Draft Interim-designated HCA's - Proposed Habitat Conservation Areas identified in the Interim Habitat Management Guidelines for Maintaining Well-distributed Viable Wildlife Populations within the Tongass National Forest, Draft Environmental Assessment (1994a).

Ecosystem - The complete system formed by the interaction of a group of organisms and their environment.

Edge - Where plant communities meet or where successional stage or vegetation conditions within the plant community come together.

Forage - All browse and nonwoody plants that are available to domestic livestock or game animals and used for grazing or harvested for feeding.

Fragmentation - A process which results in a small unit of land with its various plants and animals which has become separated from either, similar ecosystems by the intrusion of a barrier, either water or open land.

Habitat - The sum total of environmental conditions of a specific place occupied by a wildlife species or a population of such species.

Habitat Capability - The long-term potential of an area to support animals.

High Quality Habitat - Habitat suitability index (HSI) greater than or equal to 0.5.

Management Indicator Species (MIS) - A species selected for analysis because its welfare is presumed to be an indicator of the welfare of other species sharing similar habitat requirements.

Mycorrhizae - Fungi with a symbiotic relationship with the roots of certain plants.

Old-Growth Habitat - Defined as Volume Class 4 - 7 (>8,000 mbf/acre) and characterized as stands of trees well past the age of maturity (greater than 150 years of age), with declining growth rates and signs of decadence such as dead and dying trees, snags, and downed woody material.

Project-defined COGA's & Corridors - Contiguous old-growth areas and wildlife travel corridors identified by Project biologists using site-specific information.

Riparian Habitat - Areas of land that are directly affected by water, usually having visible vegetation or physical characteristics reflecting this water influence. Streamsides, lake edges, or marshes are typical riparian areas.

Travel Corridor - A belt or band of cover or habitat which allows animals to move from one location to another.

Key Terms (Continued)

Viability - Capability of a plant or animal population to exist over the long term.

Viable Population - A population which has adequate numbers and dispersion of reproductive individuals to ensure the continued existence of the species population in the planning area.

Wetlands - Areas that are inundated by surface or groundwater with a frequency sufficient to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include muskegs, marshes, bogs, wet meadows, river overflows, mud flats, and natural ponds.

Affected Environment

The Lab Bay Project Area is a mosaic of muskegs, wetlands, alpine meadows, and forest. Prior to initiation of forest management in the 1950's, forested areas were almost exclusively old growth. Timber harvest has occurred in areas of relatively easy access, such as on the gentler slopes at lower elevations. Traditional timber harvest practices, primarily clearcutting, have resulted in the rapid replacement of multistoried old-growth forest stands with young regenerating stands that are structurally and compositionally simpler than the older stands.

The response of wildlife communities to forest succession following timber harvest is complex. Each plant and animal species reacts differently to harvest, with some species benefiting during the early clearcut stage of succession (5 to 25 years), while others are detrimentally affected. Wildlife species deriving benefits during this stage, due to an increase in forb and shrub production, include black bear, long-tailed vole, and a number of migratory breeding bird species that nest and/or feed in understory vegetation. Species dependent on large, contiguous tracts of old-growth forest, such as marten, Prince of Wales flying squirrel, and Queen Charlotte goshawk, experience reduction in habitat quantity and quality, as past and future harvests reduce the extent of suitable habitat and the number of travel corridors connecting remaining tracts.

Wildlife Habitats

Habitat refers to the type of environment in which a species occurs. It can be described in terms of elevation, topographic position, or vegetative community. A species may occupy a range of different habitats, or more than one distinctive kind of habitat in different seasons. Habitats that occur within the Lab Bay Project Area include old growth, second-growth forest, alpine/subalpine, wetland, beach fringe, estuary, and riparian. Many of these habitat types overlap; for example, beach fringe and estuary may include old growth, forested, and wetland habitats.

To facilitate discussion of wildlife habitats, three analyses are presented. First, all forested project lands are described by forest successional stages. Nonforested acres are described as a single category. Secondly, the nonforested habitats and special wildlife habitats such as riparian and beach fringe are presented. Finally, an analysis of the old-growth forest successional stage is presented. This analysis includes the use of plant series and timber volume class information, and addresses the components of patch size and travel corridors.

Wildlife habitat information was obtained from the Ketchikan Area Geographic Information System (GIS), Thorne Bay Ranger District, and Alaska Department of Fish and Game, and was updated with site-specific information acquired during the 1992 and 1995 field inventories. The Wildlife Analysis Areas (WAA's) and Value Comparison Units (VCU's) within the Project Area are identified in Table 3-67.

Table 3-67
Project Area WAA's and VCU's

WAA Number	Acreage of WAA in Project Area	Acreage of National Forest System Lands	% of WAA in Project Area	VCU's in WAA
1527	37,474	31,035	87%	531.1, 531.3, 536, 537.1
1528	24,752	24,428	100%	534.0, 534.1, 534.2, 534.3, 534.4
1529	71,396	68,333	100%	527, 528.0, 528.1, 529, 530, 532, 533
1530	40,735	36,049	71%	535, 538, 539, 540, 551

Source: Ketchikan Area GIS

Wildlife Analysis Areas (WAA's)

Wildlife Analysis Areas (WAA's) are geographic units of land identified by Alaska Department of Fish and Game and used by the Forest Service for wildlife analysis. WAA's within the Lab Bay Project Area are displayed in Figure 3-11. Acreages reflect the portion of the WAA that is within the Project boundary. The following Wildlife Analysis Areas are found within the Lab Bay Project Area:

WAA 1527 (37,474 acres)

WAA 1527 borders most of the southern shoreline of the Lab Bay Project Area and extends north into its interior. Geological features which characterize this WAA include karst formations such as caves and sinkholes, historic and active landslide areas, and cliffs. Approximately 9,187 acres are natural open areas (i.e. naturally fragmented, nonforested habitat). Muskeg and swamp habitat also occurs. Timber harvest conducted from 1954 to the present has increased fragmentation by 5,931 acres.

Large areas identified as important bear, wolf, wintering deer and waterfowl, and Canada goose habitat occur throughout this WAA. Bald eagle nests have been documented along the El Capitan Passage shoreline. During field work conducted in 1992 and 1995, bears and bear dens, wolves, bald eagles, goshawks, and one pair of loons were documented. Sandhill crane vocalizations were also documented in the easternmost portion of this WAA.

WAA 1528 (24,752 acres)

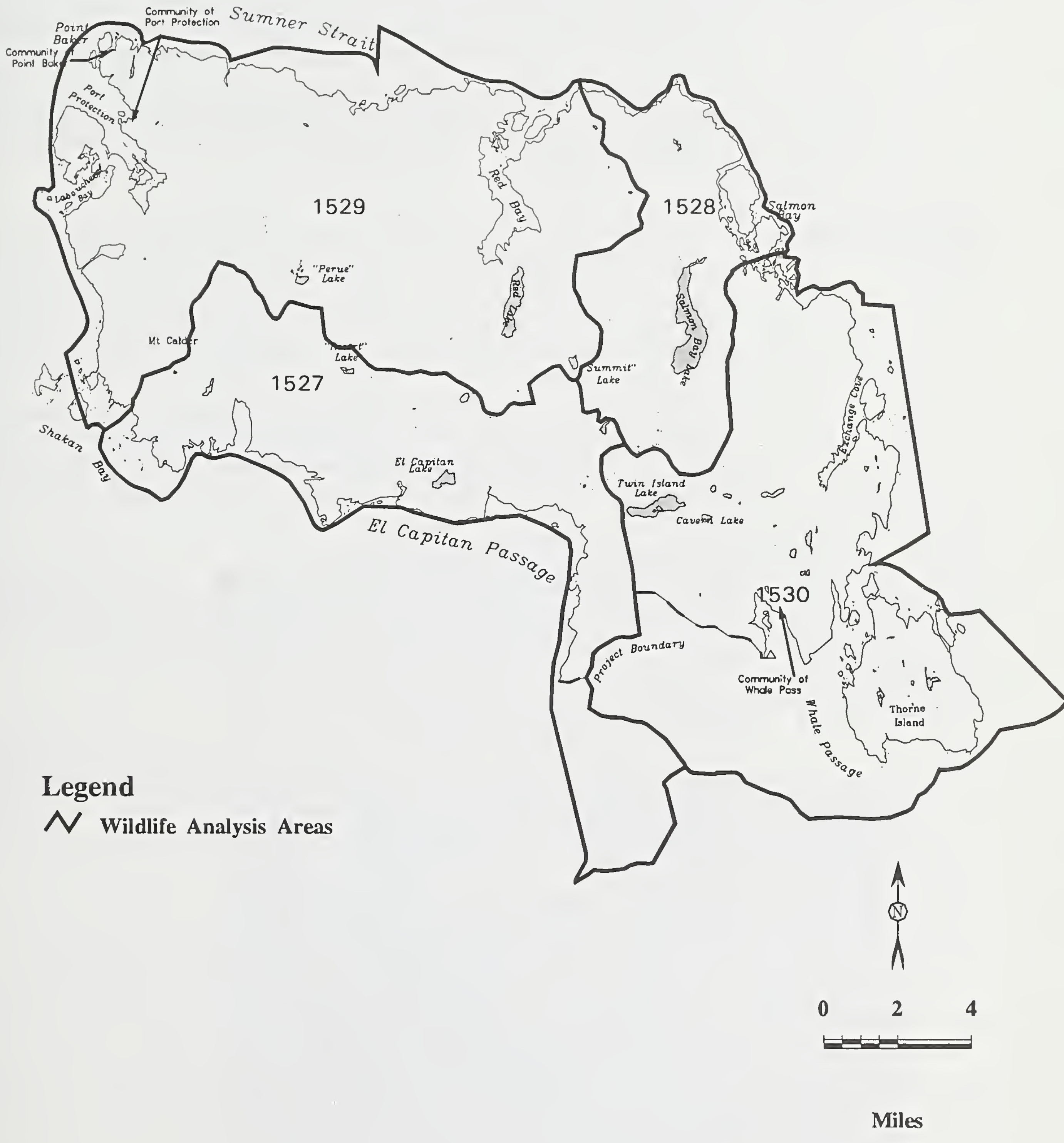
WAA 1528 is located in the northeastern portion of the Lab Bay Project Area and extends south beyond Salmon Bay Lake. The most significant geographic feature within this WAA is Salmon Bay Lake and its surroundings. Geologic features include numerous cliffs and landslide areas scattered throughout the WAA. Approximately 4,151 acres are naturally fragmented. Past timber harvest has increased fragmentation by 2,158 acres.

Over one dozen bald eagle nests have been documented along the coastal shoreline. Wildlife observations reported during the 1992 field season include bear, deer, wolf (including a potential den site), marten, woodpecker, red-tailed hawk, and goshawk.

WAA 1529 (71,396 acres)

WAA 1529, in the northwest corner of the Lab Bay Project Area, includes nearly the entire western coastal area and extends eastward. Prominent geological features in the WAA include cliffs, cave entrances, active landslides, bluffs, talus slopes and sinkholes. Approximately 20,247 acres are naturally fragmented. This WAA also displays a variety of special wildlife habitats, such as muskegs and other wetland areas (beaver ponds and sedge meadow complexes) exhibiting high snag densities. Timber harvest conducted from 1954 to the present has increased fragmentation by 15,065 acres.

Figure 3-11
Wildlife Analysis Areas



Source: Ketchikan Area GIS

Habitat within this WAA supports bear, wolf, wintering deer, Canada goose, and peregrine falcon. Observations during the 1992 field season included bear (and dens), wolf, deer, bald eagle, goshawk, woodpecker activity and nests, sandhill cranes, and rough-skinned newts.

WAA 1530 (40,733 acres)

WAA 1530 is located in the southeast corner of the Lab Bay Project Area. Prominent geological features include bluffs, caves, and cliffs. Approximately 19,199 acres of this WAA are naturally fragmented. Past timber harvest has increased fragmentation by 11,076 acres.

Deer winter range, mergansers, Canada goose, bear, wolf (and dens), sandhill cranes, and wintering trumpeter swan habitat occur here. During the 1992 field season, biologists observed deer, bear, marten, and goshawk. Otter, beaver, beaver ponds, along with small wetlands, were also observed.

Forest Successional Habitats

Forested habitats mapped on the Ketchikan Area GIS include all areas with at least ten percent forest cover. Many wildlife species, including those dependent on old growth, make use of the forested stands within the Project Area. Table 3-68 indicates that 113,547 acres of productive, forested habitat exist in the Project Area. Nonforested habitats are described in the Silviculture section. Noncommercial, forested habitat (<8,000 board feet/acre) is not considered suitable for harvest and does not meet the definition of old-growth habitat; therefore it has not been included in Table 3-68.

The general successional sequence of a stand following even-aged management is outlined below and includes the current acreage of each forest successional habitat within the Project Area by WAA. Ages and size classes represented in the stages will vary to a certain degree among forest stands since growth and yield depend on factors such as site topography and weather conditions.

Currently NonStocked (6,054 acres)

For the first five years following harvest, grasses, forbs, shrubs, and conifer and hardwood seedlings flourish. Several species of small mammals, including the long-tailed vole; furbearers, and songbirds such as the orange-crowned warbler, Wilson's warbler, and Swainson's thrush use these areas during at least a portion of their life cycle (DellaSala et al. 1993).

Seedling/Sapling (26,225 acres)

For the 6- to 25-year period following harvest there is an increase in forb and shrub production. A number of wildlife species use this successional stage, including black bear, long-tailed vole, deer, and wolves (Thomas et al. 1979a). Sapling crown closure occurs during this stage. Shade-intolerant grasses, herbs, and shrubs decline because of increased shade from the crown closure of the tree canopy. Conversely, shade-tolerant understory species, such as hemlock seedlings, gradually increase.

Pole/Young Growth Forest (2,185 acres)

Crown closure is usually complete by 25 years, causing the understory layer to change from a dense shrub, herb, and seedling composition, to one of dense moss. The young trees are small, densely stocked and of uniform size. Large diameter snags and snag replacement trees are absent, although large-diameter logs may persist for more than 70 years. These stands exhibit a poorly developed understory and an even-aged overstory that provides low diversity and low habitat value for wildlife that may persist for more than 75 years (Sigman 1985). This stage provides hiding and thermal cover for big game species and is used to some extent by smaller-sized species, including winter wren, golden-crowned kinglet, beaver, and mink (Thomas et al. 1979a).

Old Growth Forest (79,084 acres)

Approximately 150 years after harvest, an understory of deciduous shrubs, herbs, and conifer seedlings begins to develop in an unmanaged stand (Sigman 1985). Uneven-aged trees, old-

growth overstory structural features, and large-diameter snags with denning cavities begin to develop, becoming more prevalent over the next two centuries. Old-growth habitat is comprised of stands of Volume Class 4-7 (greater than 8,000 mbf/acre), characterized by trees well past the age of maturity, with declining growth rates and signs of decadence, such as dead and dying trees, and downed woody material. These stands are used extensively by species including Sitka black-tailed deer, black bear, gray wolf, marten, Vancouver Canada goose, northern goshawk, bald eagle, and cavity nesters.

Table 3-68
Successional Stages in Acres, Current Condition (1995)*

WAA	NonStocked (0-5 Yrs)	Seedling/Sapling (5-25 Yrs)	Pole/Young Growth (25-150 Yrs)	Old Growth (VC 4-7)
1527	1,372	4,555	0	17,619
1528	1,025	1,405	59	11,235
1529	1,906	11,529	1,486	35.952
1530	1,752	8,737	640	14,278
Total	**6,054**	**26,225**	**2,185**	**79,084**

Source: Ketchikan Area GIS

* Includes old growth located on state, private, and encumbered lands.

Special Wildlife Habitats

In addition to the forested habitats described above, other categories of wildlife habitat are present in the Lab Bay Project Area. These special habitat categories are composed of forested and/or nonforested lands and are defined by physical factors including elevation, geology, and topography, as well as by vegetative community. Wildlife species vary in their use of these habitats, with some showing complete dependence on a single habitat category, while others may use more than one type differentially over the seasons. The special wildlife habitats discussed below include beach fringe and estuary and riparian management areas.

Table 3-69 presents the acres of special habitats in the Project Area under current conditions. These categories overlap with other habitats, including commercial forestland.

Table 3-69

Acres of Special Wildlife Habitats by WAA, Existing Condition (1995)

WAA	Beach Fringe and Estuary[1]	Riparian Management Areas[2]
1527	3,218	5,189
1528	2,169	4,559
1529	7,668	11,262
1530	6,211	7,753
Total	**19,265**	**28,763**

Source: Ketchikan Area GIS

1 Includes acres on state, private, and encumbered lands.

2 Includes the four buffer components of the Stream and Lake Protection LUD.

Beach Fringe and Estuary

The area within 500 feet of the mean high tide is defined as the Beach Fringe (TLMP Draft Revision 1991a). This area is a transition zone between land and water, salt and freshwater, and vegetated and nonvegetated conditions. Forested areas in this zone receive heavy use by species with high economic, recreational, subsistence, or aesthetic values. Black bear, other furbearers, bald eagles, Sitka black-tailed deer, shorebirds, and Vancouver Canada goose are species that typically concentrate their activities in the beach fringe forests during some or all seasons. Many of these species exhibit a preference for, or dependence on, old-growth forest stands.

Estuary fringe habitats are defined by a 1,000-foot zone inland from the mean high tide line bordering an estuary (TLMP Draft Revision 1991a). The diverse estuary habitats provide even

greater value to wildlife than beach fringe habitats. Black bear, river otters, mink, bald eagles, shorebirds and waterfowl use estuary habitats.

Early timber harvest in the Lab Bay Area was concentrated in Beach Fringe and Estuary areas because of the quality of timber and ease of access. Table 3-70 shows that 13,669 acres of old-growth forest were present within these areas prior to timber harvest, compared to 10,543 acres currently standing.

Riparian Areas (Stream and Lake Protection LUD)

Riparian habitat is located at the transition from aquatic to terrestrial habitats along rivers, streams and lakes. It is recognized for its value to a wide variety of species including bald eagles, furbearers, and black bears. Riparian corridors provide travel and migration pathways for numerous species due to the presence of forage, water, and cover. Within the Lab Bay Project Area, riparian management areas are defined according to Tongass National Forest standards for the Stream and Lake Protection LUD (TLMP Draft Revision 1991a). The width of the riparian management area varies with the channel type and stream and lake class; however, the minimum width that is managed for riparian values is always 100 feet.

Table 3-70 indicates that 19,031 acres of old-growth habitat was present within the riparian management area (Stream and Lake Protection LUD) prior to timber harvest. Currently, 14,846 acres of old growth are present, 5,422 of which are within the No Commercial and No Programmed Harvest buffers.

More detailed information on the management of riparian habitat is presented in the Floodplains, Wetlands, and Riparian Areas Section of this chapter.

Table 3-70

Acres of Old Growth Within Beach Fringe and Estuary and Riparian Areas, Prior to Timber Harvest and Existing Condition

	Prior to Timber Harvest	Current Condition
Beach Fringe and Estuary	13,669	10,543
Riparian Management Area	19,031	14,846

Source: Ketchikan Area GIS

Old-Growth Forest

Old-growth forests are an important component of the temperate rain forest ecosystem of Southeast Alaska. Old growth is defined as Volume Class 4-7, typically characterized by a multilayered canopy, large-diameter trees, a well-developed understory component, and the presence of dead and downed woody material. Because of its structural complexity, old growth provides a variety of niches for species whose existence is thought to be old-growth dependent, including animals, understory plants, and microorganisms such as mycorrhizae.

The Forest Service considers all commercial and noncommercial forestland in the Tongass National Forest that previously has not been harvested to be old growth. To better address the function of old growth in meeting the life requirements of wildlife species, the definition of old growth can be expanded to include not just age, but also the structural differences in old-growth stands. These attributes include such factors as height and diameter of trees, spacing, snags (standing dead trees), canopy layers and structure, understory structure and composition, and the amount of down material (TLMP Draft Revision 1991a). Much of the old growth in Southeast Alaska is not dominated by large stature and large diameter trees, as is typical in the Pacific Northwest, and not all old growth exhibits a well-developed multilayered canopy. Therefore, the

old-growth stands vary in their ability to meet the needs of old growth-dependent wildlife species.

Structural characteristics of old-growth forests can be described by the plant association series of the stand and by the volume of the stand, as presented in the following sections.

Old Growth Structure of Plant Series

A group of plant associations sharing the same climax species within the forested landscape is referred to as a plant series. A series characterizes the general plant species, structure, and productivity of the site. This information assists in predicting the wildlife species expected to use an area.

From the standpoint of functional value to wildlife, each plant series provides a different set of habitat attributes. It is estimated that over 100 animal species are associated with old-growth forests in Southeast Alaska. These species are expected to differentiate among habitats on the basis of age, composition, and/or structure (Sigman 1985). The TLMP Draft Revision (1991a, Table 3-55) differentiates old growth by each plant series and its associated characteristics. A more complete discussion of functional wildlife values as they relate to plant series, and the vegetative descriptions of each plant series, are found in the Silviculture section of this document and the Wildlife Resource Report (Confer and Hall 1994).

Forested stands of the western hemlock, western hemlock/western red cedar, and Sitka spruce series are most commonly found at the lower elevations of the Project Area and generally exhibit the characteristics associated with higher volume stands. The wide range of tree diameters, including a large percentage of tall, large-diameter trees, is complemented by moderate to high snag densities which provide excavation habitat for cavity-nesting species. Heavy limbs on the overstory trees intercept snow, providing good thermal cover for Sitka black-tailed deer and nesting habitat for marbled murrelet. An abundant supply of downed woody material is also typical within these series. Of these three lower elevation plant series, the western hemlock series is considered the most favorable for old-growth dependent species (USDA Forest Service 1992e).

The western hemlock/Alaska yellowcedar, mixed conifer, and mountain hemlock plant series are typically found at the mid- to upper elevations of the Project Area. These stands, typically associated with sites limited by poor soil drainage and tree sizes somewhat smaller than the western hemlock and Sitka spruce series, generally fall into the lower volume old-growth classes. Stands are usually more open and park-like than the higher volume forests, providing less than optimal thermal cover for wildlife. While they exhibit a higher density of snags, the yellowcedar component is less useful to cavity-nesters due to its hard wood.

The shore pine series occurs most commonly as a fringe around muskegs and represents the transition zone from muskeg to open, poorly-drained mixed-conifer forests. These series exhibit the highest plant species diversity among forested stands. Open areas provide forage for bear and deer, particularly during the summer months when snow cover is not a concern. The openness and small diameter trees within these forested stands reduce use by snag-dependent species and wildlife requiring hiding cover.

Spatial Distribution of Old Growth

In addition to stand-level structural attributes of old growth, its pattern of distribution across the landscape is also important for wildlife. Large, contiguous tracts of old growth provide different habitat values than do small, fragmented patches. The degree of connectivity between patches further modifies their suitability. From an ecosystem management standpoint, the value of old-growth habitat to wildlife species must be addressed not only on a total acreage basis, but also from a patch size and connectivity basis.

TLMP 1979, as amended

TLMP (1979, as amended) identified the need to set aside areas of operable commercial forestland for the protection of wildlife and fish requiring old-growth habitat for their survival. For

the 1989-94 KPC operating period, old growth retention and extended rotation areas were tentatively identified by the Forest Service and ADF&G (USDA Forest Service 1989c). In the Lab Bay Project Area, 18,035 acres of retention and 12,259 acres of extended rotation were identified. These areas typically occurred in groups concentrated along coastal and lakeshore portions of the Project Area. The extended rotation and retention areas were never formally mapped for inclusion in the Forest Plan. Approximately 600 acres of the tentatively identified retention areas were harvested under the 1989-94 sale. Acres of old growth within retention and extended rotation areas are presented in Table 3-71.

TLMP Draft Revision (1991a)

Under the TLMP Draft Revision (1991a), several different proposed LUD's reserve old-growth areas from timber harvest (e.g. Beach Fringe and Estuary, Stream Protection, LUD II, Special Interest Areas). These LUD's are intended to allow for seasonal wildlife migration from lowland to higher elevation ranges, to provide adequate acreage for forest interior and old-growth dependent species, and to facilitate genetic exchange between wildlife populations.

Table 3-71 compares the total acres of old growth within retention and extended rotation areas with that maintained under the TLMP Draft Revision (1991a) LUD system. The acreage of old-growth forest present prior to timber harvest activity is also identified. Under the TLMP Draft Revision (1991a), 24,963 acres of old growth within the Project Area are reserved from harvest. Retention areas include a total of 17,435 acres of old growth.

Table 3-71
Total Old Growth and Retention and Extended Rotation Old-Growth Acreage, by LUD

	Acres of Old-Growth Forest			
	Prior to 1954	1995	Retention	Extended Rotation
Unmodified/Near-Natural LUD's:				
Stream and Lake Protection LUD[1]	5,156	4,452	1,043	587
Beach Fringe and Estuary	13,690	10,543	4,964	105
LUD II	6,770	6,399	1,416	2,196
Special Interest Area	2,838	2,436	67	80
Wild/Scenic River[2]	1,131	1,133	147	365
Total	**29,585**	**24,963**	**7,637**	**3,333**
Modified/Highly Modified LUD's:				
Stream and Lake Protection LUD[3]	11,201	8,135	1,380	1,197
Timber Production	43,216	26,511	3,245	3,512
Modified Landscape	21,358	13,351	3,306	1,402
Scenic Viewshed	7,814	6,004	1,867	2,815
Total	**83,589**	**54,001**	**9,798**	**8,926**
Grand Total	**113,174**	**78,964**	**17,435**	**12,259**

Source: Ketchikan Area GIS

[1] No Commercial Harvest and No Programmed Harvest components.

[2] Scenic River included within LUD II on Project Area.

[3] Selective Harvest and Planning Level components.

Contiguity, Fragmentation, and Connectivity

The loss of old-growth forest habitat due to the creation of many small patches in formerly contiguous forest is one of the major issues related to old growth. One method of countering fragmentation (i.e. the isolation of old-growth patches within a non-old-growth matrix) is to provide landscape linkages, usually defined as linear corridors of habitat that physically connect larger habitat patches. This connectivity not only links habitats, but links species, communities, and natural processes, minimizing isolation and the gradual decline of plant and animal species, and maintains the gene pool flow between old-growth blocks (Harris 1984, Hunter 1990).

Within the Project Area, eight large, contiguous blocks of old-growth forest (Volume Class 4 and greater) have been identified, as have old-growth forested corridors which currently link them together (Figure 3-12). Additional connections between the largest blocks in the Lab Bay Project Area are provided by smaller individual patches of old growth. Presented below is a description of the eight blocks, their acreages, and their linkages.

Mt. Calder (LUD II)

This block, consisting of 9,701 acres within the Project Area boundary, is located primarily within the Mt. Calder/Mt. Holbrook LUD II area, and is surrounded on its inland side by units harvested between 1975 and 1991. This LUD II extends southward into the Central Prince of Wales Project Area. The area is bordered on its west side by shoreline. The Mt. Calder block includes a contiguous old-growth patch northwest of Hole-in-the-Wall Lake, located along the shoreline of Sumner Strait and outside the LUD II boundary. A linear corridor containing interior old-growth habitat, located immediately north of Calder Bay, links the Mt. Calder area with other contiguous old-growth patches. This corridor was documented as an active travel corridor during the 1992 field reconnaissance.

Baker Creek

This isolated block, in the northwest corner of the Project Area, consists of 4,292 acres of old growth including 1,390 acres in the Point Baker state-owned parcel. Since the state land consists primarily of contiguous old-growth forest, this portion of the Project Area was considered in the analysis. It is anticipated that although some additional development may occur within the state-owned land, the majority of the old growth will be maintained.

A large percentage of the Baker Creek block's perimeter, not adjacent to state land, is bordered by previously harvested stands 13-years-old and younger. The remaining perimeter is part of the Port Protection shoreline.

Calder Bay

This 2,897-acre patch contains important deer wintering habitat along its lowest elevations on the east shore of Calder Bay. Three large units, harvested in 1991 and 1974, have fragmented the southeast portion of this patch. A narrow old-growth corridor, located northeast of the tip of Calder Bay, is bordered on its east and west sides by large stands of young forest.

South Perue

This 1,701-acre old-growth block is located at the lower elevations of Perue Mountain's south aspect. The surrounding matrix extending beyond its south and west edges consists of large units harvested in 1975 and 1991. Its north edge forms the transition zone to the higher subalpine and alpine elevations of Perue Mountain. The South Perue block is connected to the North Perue block by a narrow old-growth corridor which traverses the east face of Perue Mountain (South Perue corridor).

North Perue

This 3,865-acre area is located north of the Perue and North Perue Special Interest Area LUD's. A large area situated northwest of the North Perue block has been heavily harvested, with little remaining interior old-growth habitat. The South Perue corridor, although narrow, provides the only linear and contiguous old-growth linkage to another large old-growth block (South Perue). Stringers of old growth bordered by previously harvested units are interspersed throughout the

northwest portion of the Project Area. The narrow and nonlinear structure of these old-growth stringers and the early-successional forest surrounding them, are unlikely to provide functional connectivity between the Mt. Calder and Red Bay old-growth blocks.

Red Bay

This 2,301-acre old-growth block extends west from the lower tip of Red Bay. Its northern edge is bordered by a very large, contiguous area of previously harvested units. Its west and south edges are adjacent to a chain of previously harvested, early-successional forest and high-elevation, alpine and nonforested areas. The narrow shoreline at the toe of Red Bay is entirely edge habitat (≤300 feet in width) bordered on the south by a young stand. It provides the only old-growth corridor linking the Red Bay and Red Lake blocks. Another strip of old growth, identified as important deer habitat, runs parallel to the west shoreline of Red Bay, and links the Red Bay block with the Sumner Strait shoreline.

Red Lake

This contiguous block (3,411 acres) is bordered on its north side by a large, young harvest unit and Red Bay; on its west side by units harvested in the 1980's and nonforested habitat; on its south edge by nonforested and alpine forest areas; and on its east side by alpine habitat and recently harvested areas. One old-growth corridor links the Red Lake block to the Salmon Bay Lake block. Timber harvest conducted in the 1980's and 1990's has narrowed this corridor; however, interior old-growth habitat has been retained throughout its length. The Red Lake block is also joined to the Salmon Bay Lake block at its north end by an irregularly-shaped, nonlinear patch of old growth. Although this patch likely functions as quality habitat for old-growth dependent and interior species, it was not considered a suitable corridor due to its non-linear and irregular shape, and narrow segments. These characteristics would potentially reduce ease of movement for species by acting like a maze, allowing animals to wander and spend more time passing through the corridor.

Salmon Bay Lake

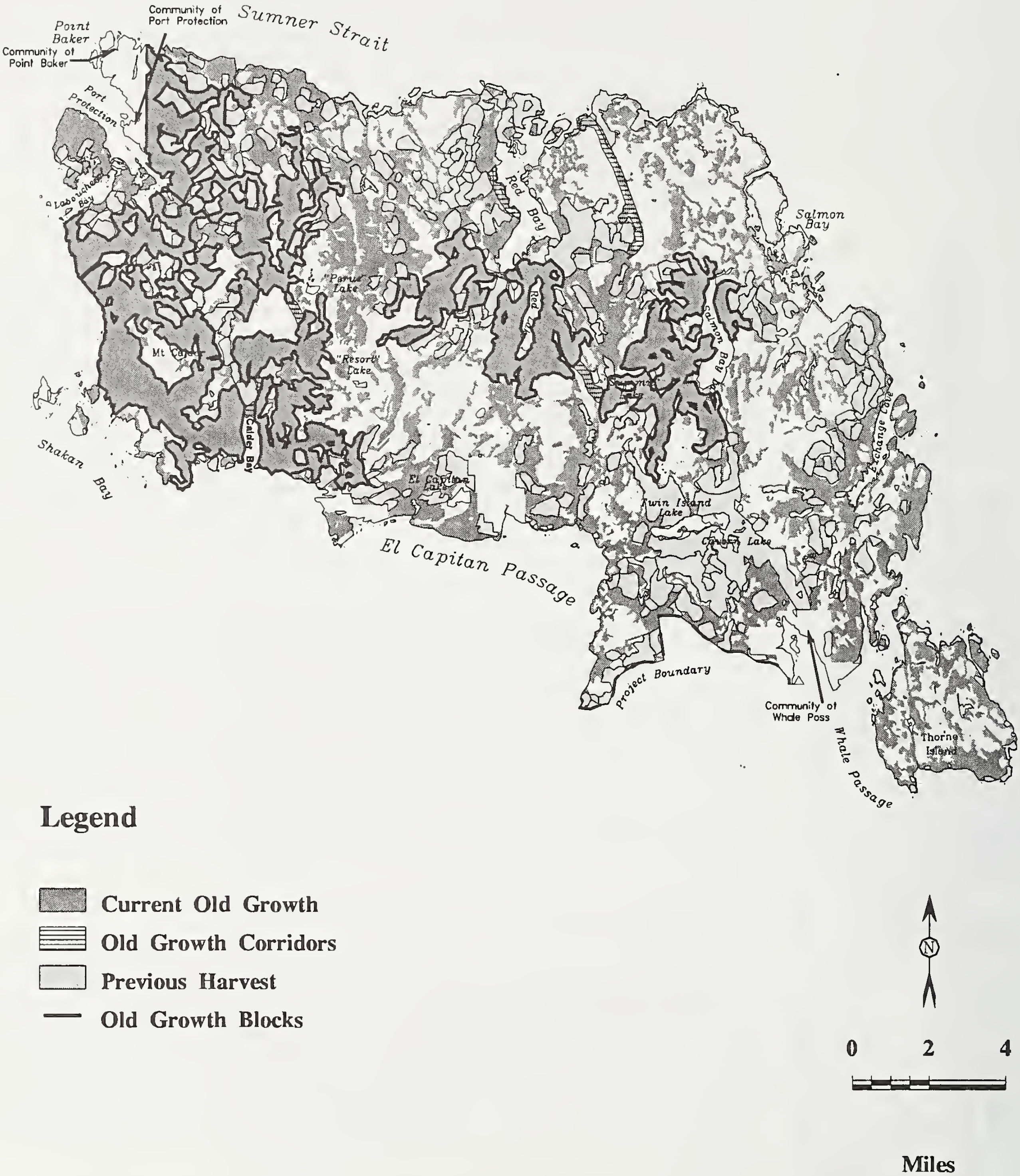
The majority of the old-growth forest within this 5,394-acre block is located adjacent to Salmon Bay Lake and lies within LUD II boundaries. The block covers a large area extending primarily from the west and south shorelines of Salmon Bay Lake. A 300-acre patch borders the northern half of the east shoreline. The remaining length of shoreline consists primarily of nonforested land. Low quality habitat (Volume Class less than 4) dominates the northeastern Salmon Bay Lake patch. Stringers of old growth extend outwards from the block and spread throughout the northeastern corner of the Project Area. A forested band running north-south along Pine Creek is the last remaining strip of high-quality habitat between Salmon Bay and Red Bay. Most of the land between these bays is low quality habitat that provides marginal winter cover. Alaska Department of Fish and Game has documented concern for this important band of habitat (ADF&G 1992c).

Old Growth Patch Size Frequency and Effectiveness

Old-growth forests in the Project Area show a high level of natural fragmentation due to numerous interspersed muskegs, other wetlands, and alpine areas. Over forty years of staggered-set clearcutting within the Lab Bay Project Area has increased fragmentation of its old-growth forests. The viability of remnant patches as wildlife habitat is a function of edge effects that depend on patch size and isolation (Lehmkuhl and Ruggiero 1991). Habitat for plant and animal species which avoid forest edges and thrive in the forest interior is lost in patches which are effectively all edge and which have lost the critical attributes of the old-growth condition. These edge effects reduce the effective size and functional viability of patches for plant and animal communities.

Figure 3-13 compares the interior patch size frequency as it currently exists and how it was prior to most timber harvest (pre-1954) throughout the Project Area. Frequency is the number of old-growth patches within a particular size range. Interior old growth was delineated by inserting a 300-foot edge buffer within each patch. This buffer width was chosen based on studies showing

Figure 3-12
Existing Old Growth Blocks and Corridors



Source: Ketchikan Area GIS

that attributes of interior habitat can be maintained at distances of over 300 feet from an edge (Temple 1986).

As Figure 3-13 indicates, fragmentation of the old-growth forest has resulted in a high proportion of small patches, compared to patches exceeding 1,000 acres in size. This trend is most evident in the northwestern and southeastern portions of the Project Area, where extensive timber harvest has occurred in the past three decades (see Figure 3-12).

Large areas of forest having compact rather than elongated shapes, unbroken rather than indented perimeters, and contiguous old growth rather than inclusions of open habitat, provide higher quality habitat for interior forest species (i.e., marten and brown creeper), since these shapes exhibit a lower proportion of edge in relation to interior habitat. This suggests that wildlife management practices should consider the shape and size of habitat within old-growth patches.

Figure 3-13
Interior Patch Size Frequency of Old Growth Within the Lab Bay Project Area (Current and Pre-harvest)

Source: Ketchikan Area GIS

* These numbers are the actual values of interior patch size frequency.

Edge Effect

Edges form where successional stages or vegetative conditions within plant communities meet. The diversity and abundance of wildlife, especially game animals, is often greatest near the edge (Hunter 1990). For example, the Sitka black-tailed deer uses the edge where one ecosystem provides hiding and thermal cover, and the adjoining ecosystem provides forage vegetation.

Timber management and road construction have a major influence on edge effect, since harvest prescriptions, such as clearcutting, increase edge. Over the short-term, this increases the biodiversity of a landscape, benefiting species such as deer (summer range) and various songbirds, that favor edge habitat. However, an area's diversity cannot be increased indefinitely by creating more and smaller "islands", or more and more edge. A threshold is reached, beyond which additional edge leads to a stabilization or reduction in numbers of species supported. Additionally, increased edge can make interior forest species susceptible to competition, temperature changes and predators.

An edge analysis was conducted for old-growth forest within the Lab Bay Project Area to calculate the average ratio of the core area to total area of old-growth patches within each patch size interval (Table 3-72). Ratios were determined by dividing the interior acreage of an old-growth patch by its total area. The largest, most compact patch shapes resulted in the highest ratio values. Patches with elongated shapes, indented rather than entire unbroken perimeters, and/or inclusions of open habitat resulted in a low ratio of core area to total patch area, because of the high percentage of edge habitat in these fragments.

The overall effect of timber harvest between 1954 and 1995 has been a decrease in the number of large patches within the Project Area. In addition, the ratio of interior habitat to total patch size has, on the average, decreased, causing a corresponding increase in edge habitat (Table 3-72).

Table 3-72
Interior Old Growth Habitat Ratios, Current and Pre-Harvest

Interior Patch Size Range (acres)	No. of Patches Pre-1954	No. of Patches Current	Average Ratio Pre-1954	Average Ratio Current
<1	143	175	—	0.02
1-10	165	118	0.22	0.14
11-50	90	69	0.41	0.30
51-100	31	28	0.52	0.42
101-500	42	25	0.64	0.53
501-1000	7	6	0.67	0.59
1000-10,000	6	3	0.74	0.64

Source: Confer and Hall 1994

Management Indicator Species

Management Indicator Species (MIS) are animals whose population changes are believed to indicate the effects of land management activities (USDA Forest Service 1982). The concept of MIS was developed to promote more effective management of wildlife and fish habitats on National Forest System Lands. Management Indicator Species have been selected and Management Requirements (MR's) identified for wildlife species within the Region to ensure that there is adequate habitat to maintain population viability and biological diversity, and to establish management goals for species in public demand.

The following serve as Management Indicator Species for this project and will be discussed in this section:

SPECIES	RATIONALE FOR THE SELECTION
Sitka black-tailed deer	Represents species using low elevation old-growth forest habitats during the winter period; important game species
Black bear	Represents estuarine habitat; game species
Gray wolf	Predator tied to a specific prey base
Marten	Low elevation old-growth winter habitat; important furbearer
River otter	Represents riparian habitat; furbearer
Vancouver Canada goose	Represents riparian habitat; game species
Bald eagle	Old-growth coastline; high public interest
Red-breasted sapsucker	Cavity excavator using low-volume old growth
Hairy woodpecker	Cavity excavator using high-volume old growth
Brown creeper	Represents large, high-volume old growth

The Lab Bay Draft EIS presented habitat capability data from models contained in the 1991 TLMP Draft Revision. Habitat capability models are not intended to predict population levels or set bag limits. Their use is intended to give a relative comparison between alternatives of the effects to habitat, not to make projections of actual animal numbers. In keeping with the intended use of the model data, Final EIS tables and figures displaying the habitat capability model results have been modified to show only the relative habitat capability, expressed as a percentage of the 1954 (prior to commercial harvest) capability.

The recently published 1996 TLMP Draft Revision (USDA Forest Service 1996) has discontinued use of habitat capability models, with the exception of a modified deer model. The modified deer model has been analyzed for the Lab Bay Project, and the results are presented in Appendix P. The revised deer model showed results similar to the earlier model for the Project Area. For other species, the 1996 TLMP Draft Revision incorporated species assessments prepared by expert panels to document expected effects of implementation of the proposed Forest Plan revisions (USDA Forest Service 1996). Although the assessments were prepared on a Forest-wide, rather than Project-specific basis, they predict effects that are consistent with those described in this EIS for the Lab Bay Project. The analysis for the Lab Bay Project, as presented herein, remains valid in light of the additional information provided in the species panel assessments (USDA Forest Service 1996).

Habitat capability models estimate habitat quality, but do not predict actual population levels. Populations are frequently above or below habitat model predictions at any given point in time for a multitude of reasons including weather, and hunting and trapping pressure. Results of models (both 1991 and 1996 deer models) run for the Lab Bay Project show decreasing habitat capability over time. It should be noted that changes in weather (such as severe winter snow depths), changes in hunting pressure, or other factors affecting actual populations can also result in effects to deer populations.

The effects of fragmentation on population levels are not included in the Habitat Capability Models (HCM's). A relationship between old-growth patch size (i.e. fragmentation) and habitat capability has been developed for five of the MIS that occur within the Project Area (Table 3-73). A fragmentation analysis was conducted based on this information, and the results have been incorporated into the population values for these species. Fragmentation of old growth reduces the effectiveness of the remaining patches as wildlife habitat, with individual species responding to fragmentation differently. For example, species like the brown creeper and hairy woodpecker can be supported by smaller patches of forest habitat than can deer and marten. Therefore, patch size effectiveness curves were developed for each of the five species (USDA Forest Service 1989b). These, in association with the number of acres within each patch size class, were used to adjust the relative habitat capability values for species listed. Patch-size effectiveness percentages for 1954 range from 100 percent (brown creeper) to 86 percent for deer (Table 3-73). This reduction represents the natural fragmentation within the Project Area. The values for 1995 vary from 100 percent effectiveness (brown creeper) to 79 percent effectiveness (deer). The greatest difference in percent effectiveness between 1954 and 1995 was for deer, which showed a 7 percent reduction in patch effectiveness.

The results of the MIS analyses for current and pre-harvest (prior to 1954) conditions are presented in Table 3-74.

Table 3-73
1954 and 1995 Patch Size Effectiveness Percentages[1] for Selected MIS

Species	1954 Patch Effectiveness	1995 Patch Effectiveness
Black-tailed Deer	0.86	0.79
Marten	0.94	0.90
Red-breasted Sapsucker	0.96	0.93
Hairy Woodpecker	0.89	0.84
Brown Creeper	1.00	1.00

Source: Confer and Hall 1994

[1] Based on proceedings of a workshop to recommend patch size relationships and corridor requirements for the MIS and TES species (USDA Forest Service 1989).

Table 3-74
Estimated MIS Habitat Capability for 1995 (% of 1954 HC)

Species	1995 HC	Percent Change From 1954
Black-tailed Deer[1]	84%	-16%
Black Bear	95%	-5%
Gray Wolf[2]	94%	-6%
Marten[1]	84%	-16%
River Otter	82%	-18%
Bald Eagle	79%	-21%
Vancouver Canada Goose	78%	-22%
Red-breasted Sapsucker[1]	85%	-15%
Hairy Woodpecker[1]	52%	-48%
Brown Creeper[1]	40%	-60%

Source: Ketchikan Area GIS

[1] Values are adjusted for patch size effectiveness.

[2] Wolf values are based on deer values adjusted for patch size effectiveness.

Table 3-75
1995 Open Road Densities, by WAA[1]

	Existing Miles of Open Road[2]	Open Road Density(miles/sq. mile)
1527	61.4	1.06
1528	23.1	0.62
1529	120.8	1.09
1530	103.6	1.65
Project Area	**308.9**	**1.15**

Source: Confer and Hall 1994

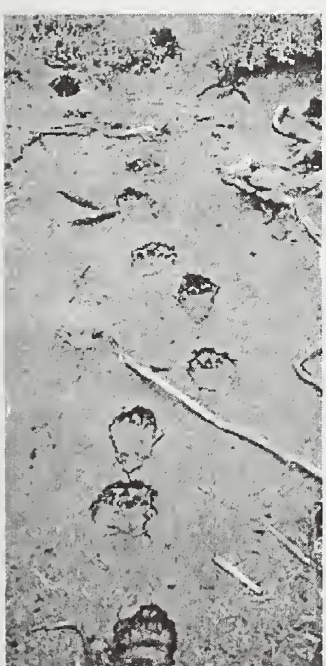
[1] State, private, and encumbered lands are included.

[2] Does not include closures planned under the 89-94 EIS that have not been implemented.

Sitka Black-tailed Deer

Sitka black-tailed deer (*Odocoileus hemionus*) is considered a generalist species that ranges through all major habitats on Prince of Wales Island. As a management indicator species, black-tailed deer represent other species that winter in lower elevation old-growth forest habitats.

Winter snow conditions affect deer populations through decreased forage availability in clearcut areas and through increased energy costs. The highest quality winter range exists on south-facing slopes below 800 feet in elevation, dominated by high volume old-growth stands. During periodic accumulations of snow, old growth-forest patches provide "optimal thermal cover" (Witmer et al. 1985). The combination of a dense canopy with scattered openings allows forage growth in the openings, while the canopy modifies snowfall sufficiently to promote forage availability and movement of deer. Early successional stands provide forage for deer during mild winters and the remaining seasons.



Bear tracks in mud

Old-growth patches of 1,000 acres or larger are believed to provide optimum deer habitat. Deer winter range fragmented into smaller isolated islands of old growth concentrates deer in predictable areas, offering far less security from wolves by reducing predator search time (Suring et al. 1993b).

The TLMP Draft Revision (1991a) habitat capability model (Suring et al. 1993b) was used to identify high quality winter range, assumed to be the most limiting factor for Sitka black-tailed deer populations. For this EIS, high quality habitat is defined as habitat with a suitability index of 0.5 or greater. When combined with winter range habitat identified by the Thorne Bay Ranger District, key habitat was determined to be present in the western portion of the Lab Bay Project Area, with particularly important areas adjacent to the shoreline. Currently, high quality deer winter range represents approximately 15 percent (26,360 acres) of the Project Area. Approximately 6,000 acres have been harvested since 1954. The Unmodified and Near-Natural Environment LUD's provide approximately 40 percent of the high quality winter habitat that remains within the Project Area. The Project-defined Calder COGA, which includes the Mt. Calder/Mt. Holbrook LUD II, Protection Head; the Project-defined Port Protection small COGA; and the Beach Fringe and Estuary LUD provide the majority of this high quality winter habitat (see later section on Conservation Strategies for a discussion of COGA's). The Draft Interim-designated Buster Creek HCA contains scattered patches of high quality habitat. Thorne Island has little high quality winter range, although there was evidence of deer use on the island during the 1992 field season. Wolf use, including an active den site, was also documented on Thorne Island, indicating that the island is supporting a population of deer.

Results of the deer model indicate that winter range in the Project Area, after adjusting for patch size effectiveness, has a 16 percent lower habitat capability for deer than in 1954, prior to the

start of timber harvesting on Prince of Wales (Tables 3-73 and 74). The results of the 1996 TLMP Draft Revision deer model show a similar decline in habitat capability for the Project Area (Appendix P).

Open road density within the Project Area is currently 1.15 miles per square mile; total road density, which incudes closed roads is currently 1.38 miles per square mile (Table 3-75). No roads existed in the Project Area prior to 1954. Road construction affects black-tailed deer habitat by displacing deer from preferred habitats, and increasing deer harvest opportunities in localized areas adjacent to roads (see Subsistence section). This is of particular concern when forest canopy cover adjacent to roads is limited (Thomas et al. 1979b; Washington Department of Wildlife 1987).

During the 1992 Lab Bay field inventory, biologists documented deer sightings and sign throughout the Project Area, with approximately 40 percent of the surveyed areas receiving use. Documented use included deer sightings, scat, tracks, browse, beds, and travel corridors. High quality deer wintering areas were identified along the majority of the coastal shoreline and estuaries and along the north shoreline of Twin Island Lake.

Black Bear

Black bears (*Ursus americanus*) range through all major habitat types in the Project Area and require large expanses of habitat, as well as protection from human disturbance. Movement and distribution of black bears is primarily influenced by the availability of food and cover. Estuarine, riparian, and coastal habitats receive the highest use by black bears. Although many of their preferred plant foods grow in openings, bears prefer not to move very far from cover while foraging; therefore, large openings without cover are not used (Suring et al. 1993b).

The availability of den sites is also a critical determinant of habitat quality for bears. The characteristics of preferred sites in Southeast Alaska (e.g., hollow logs and trees, and a well-developed understory) are typically associated with old-growth forests.

The open road density within the Project Area is currently 1.15 miles per square mile (Table 3-75). Black bear populations, which are susceptible to overharvesting, may be negatively affected by increased road densities, thereby increasing human access to areas (Kolenosky and Strathearn 1987). Road construction increases the chances of human disturbance which may result in the displacement of animals from their preferred habitats.

Bear sightings and sign were common throughout the Project Area during the 1992 field season. Dens were located in old-growth stands throughout the Project Area. Thorne Bay Ranger District personnel identified the areas surrounding the majority of bays within the Project Area as important black bear habitat.

The black bear habitat capability model indicates that the Project Area has experienced a five percent decline in habitat capability for black bear since 1954 (Table 3-74). Black bear habitat currently represents approximately 95 percent of the Project Area.

Gray Wolf

Gray wolves (*Canis lupus*) are wide-ranging, opportunistic predators (Paradiso and Nowak 1982). Therefore, the presence of gray wolves in an area appears to be dictated by the availability of habitat for its prey species (Carbyn 1987) and the intensity of human-caused mortality (Mech et al. 1988). The wolf has adapted to a carnivorous diet that is mainly made up of large ungulates or beaver (*Castor canadensis*), and when available, spawning salmon. Availability of suitable denning habitat is of secondary importance to wolves. In forested areas, dens are usually located within 1,600 feet of water, on elevated knolls (Carbyn 1987). Active denning sites may be occupied from early April to August, with the birth of pups typically occurring in mid- to late-April (Fuller 1989).

The construction of road systems and timber harvest on Prince of Wales Island has altered the habitat of the Alexander Archipelago wolves (a subspecies of the gray wolf) and their prey. High road densities directly affect wolves by bringing them into increasing contact with man. In addition, wolves are affected indirectly by logging-related reductions in Sitka black-tailed deer

(Kirchhoff 1992). The primary threat of high road densities is increased hunter accessibility. Wolves are reportedly intolerant of open road densities that exceed a 1.0 mile per square mile threshold, raising a concern of maintaining viable populations (Mech 1989, Fuller 1989, Mech et al. 1988 and Thiel 1985). Kirchhoff (1992) recommends that road densities be maintained below this level within each WAA. Additionally, sufficient habitat should be maintained to support at least five deer per square mile in areas where deer are the primary prey species. Table 3-75 displays current road density within the Project Area, by WAA. Three of the WAA's currently exceed the 1.0 mile per square mile threshold.

The USFWS was petitioned to list the Alexander Archipelago wolf as threatened under the Endangered Species Act. The petition was based on several factors: present and threatened destruction, modification, and curtailment of habitat from the reduction and long-term degradation of habitat for Sitka black-tailed deer by clearcut logging; inadequate regulation of road access leading to increased shooting and trapping of wolves; and, other factors including inbreeding within insular populations that may reduce genetic fitness, adaptability, and long-term viability (USDI Fish and Wildlife Service 1994). The U.S. Fish and Wildlife Service undertook a status review of the Alexander Archipelago wolf and found that listing was not warranted at this time (USDI Fish and Wildlife Service 1995). The wolf is considered a Category 2 Candidate species, and therefore the Tongass National Forest continues to view it as a species of concern.

A study is currently underway on north-central Prince of Wales and the adjacent islands to determine distribution and abundance, home range, movements, habitat use, and the feeding ecology of the wolf. Information to date indicates that within Game Management Unit 2 (GMU-2), only Prince of Wales Island is sufficiently large to maintain a permanent wolf population in the absence of immigration from some other source. During summer surveys, the majority of wolf observations were in old growth and old growth-muskeg habitat (Person 1993).

Wolf sightings and sign were documented throughout the Project Area. Thorne Bay Ranger District identified the areas surrounding most bays as important wolf habitat.

Habitat capability model results for gray wolves are proportional to results for Sitka black-tailed deer. The model indicates that current habitat capability for wolf is six percent lower than the pre-harvest level (Table 3-74).

Marten

Marten (*Martes americana*) prefer mature and old-growth forest and are closely associated with overmature stands with a canopy closure greater than 40 percent. The opulence of the shrub and forb layer in a typical old-growth stand, in conjunction with the structural diversity of its understory, supports a variety of small mammal prey species. Downfall, stumps or slash provide access routes allowing marten to hunt below deep snow. Overstory cover provides marten with protection from potential avian predators. The fallen logs, decadent trees, and large snags in old-growth forests provide resting and den sites for marten (Flynn 1992, Strickland and Douglas 1987).

Marten represent a species group that uses lower elevation old-growth forest habitats during the winter period. Although forest management activities resulting in easier human access will increase potential for overtrapping, the quantity and quality of winter habitat is considered the most limiting factor for marten in Southeast Alaska. High quality winter range includes old-growth stands in coastal habitats (beach fringe and estuary) and riparian areas, as well as other upland habitats below 1,500 feet in elevation. Optimum use of habitat occurs when patches of preferred habitat are greater than 180 acres, and use declines with decreasing patch size, becoming zero when patches of preferred habitat are less that 10 acres (Suring et al. 1993b, USDA Forest Service 1989b).

Marten are easily trapped and are susceptible to overharvest. Road construction reduces cover and increases human access, thereby increasing trapping vulnerability, particularly when located within marten travel corridors (ridges, saddles, and riparian areas) and foraging areas (Warren 1990). Current open road density is 1.15 miles per square mile within the Project Area (Table 3-75).

Marten sign was evident and sightings were documented throughout the Lab Bay Project Area during the 1992 field reconnaissance.

Currently, the Unmodified and Near-Natural Environment LUD's provide approximately 45 percent of the high quality marten habitat in the Project Area. The Mt. Calder/Mt. Holbrook LUD II, Salmon Bay Lake LUD II/Wild and Scenic River, and the Beach Fringe and Estuary LUD provide the majority of this habitat. Approximately 15 percent of the total high quality habitat has been harvested since 1954.

The habitat capability model indicates that the Project Area, after adjusting for patch size effectiveness, presently exhibits a habitat capability for marten that is 16 percent lower than the pre-1954 level (Tables 3-73 and 74).

River Otter

River otters (*Lutra canadensis*) are associated with both coastal and fresh water aquatic environments and the immediately adjacent (100 to 500 feet) upland habitats. High quality habitat occurs along the coast (beach fringe) and within riparian habitats along rivers, streams, and lakes up to 1,200 feet in elevation. Lakes greater than 50 acres in size provide optimum foraging opportunities. Fish is their primary food source, with a minor component of marine invertebrates (Larsen 1984).

River otter sign was documented during the 1992 field inventory at the south end of Red Bay and on the east side of Exchange Cove.

High quality habitat consists primarily of low volume old-growth stands situated along the shoreline of saltwater, large lakes (greater than 50 acres), and Class I and II riparian areas (Suring et al. 1993b). River otter habitat is almost exclusively located (93 percent) within Unmodified and Near-Natural Environment LUD's along the coastline at Protection Head; the Port Protection estuary; the area surrounding Hole-in-the-Wall and Calder Bay; and the eastern coastline, including heavy concentrations of habitat around Salmon Bay. The northeast coastline of Thorne Island also contains a large amount of high quality habitat.

The model indicates that existing river otter habitat capability in the Project Area is 18 percent lower than the pre-1954 level (Table 3-74). Current otter habitat represents approximately 8 percent of the Project Area.

Bald Eagle

Bald eagles (*Haliaeetus leucocephalus*) in Southeast Alaska prefer to nest adjacent to the coast, where they forage for fish, waterbirds, marine invertebrates, and drifting carrion. Nests are typically located in old-growth coniferous forests along the coastline and associated saltwater inlets. Nest surveys conducted by the U.S. Fish and Wildlife Service and Thorne Bay Ranger District have located a total of 109 nests along the Project Area coastline including Red Bay, Salmon Bay, and Exchange Cove. During the 1992 field reconnaissance, bald eagles were commonly observed along the coastline, including a group of 12 eagles sighted together north of Hole-in-the-Wall. Use is also expected to occur along large Class I and II streams and lakes greater than 50 acres in size. Table 3-76 displays the number of inventoried eagle nest trees, by WAA, for the Project Area. The majority of nests in the Lab Bay Project Area are within the no-harvest Beach Fringe and Estuary LUD.

Tlingit petroglyph of an eagle head, sketched by G. T. Emmons.

Table 3-76
Bald Eagle Nest Sites

WAA	Number of Nests
1527	10
1528	12
1529	41
1530	46
Total Nests	**109**

Source: Ketchikan Area GIS

The bald eagle habitat capability model is designed to evaluate nesting habitat based on geographical location, elevation, stream class, lake size, habitat type and volume class. The largest and highest quality patches are found adjacent to estuaries, especially those of Calder Bay and Hole-in-the-Wall. The El Capitan Passage shoreline exhibits more high quality eagle habitat than the Sumner Strait shoreline, although more nests have been identified along Sumner Strait.

The model indicates there are approximately 12,100 acres of high quality nesting habitat capable of supporting 314 eagles (Table 3-74). This is a 21 percent decline in habitat capability from 1954. The current density of inventoried nest sites is 0.36 nests per mile of shoreline.

Vancouver Canada Goose

The Vancouver Canada goose (*Branta canadensis fulva*) is a relatively nonmigratory species. They are unique among all subspecies of Canada geese in that they use forested habitat for nesting and brood-rearing (Lebeda and Ratti 1983). High quality nesting and brood-rearing habitat is generally associated with low volume old growth on poorly-drained soils, adjacent to small wetlands, lakes, and riparian areas. Beach fringe and estuary areas are high-quality habitats for Vancouver Canada geese.

Hansen (1962) indicated that nesting and brood-rearing is probably the most limiting habitat factor. For this reason, and the potential for effects from forest management activities, the goose model evaluates nesting and brood-rearing habitat capability on the basis of vegetation, location, and proximity to roads. Nesting begins in late-April in Southeast Alaska, with brood rearing and molting occurring through mid-August (Lebeda and Ratti 1983, Bellrose 1980).

Canada goose use of the Project Area was documented during the 1992 field season. Use was observed along the shoreline of lakes and ponds, as well as in muskegs. Model results indicate there are approximately 13,300 acres of high quality nesting and brood rearing habitat within the Project Area. This is a 22 percent decline from the pre-1954 level (Table 3-74). Current high quality goose habitat represents approximately 8 percent of the Project Area. Concentrations of habitat exist along Salmon Bay, extending west to Pine Creek, include the area surrounding Buster Creek; along Alder Creek, Marble Creek, and Big Creek; surrounding Perue Lake, El Capitan Lake, and the east side of Red Lake; the area between Salmon Bay Lake and Exchange Lake; and portions of Thorne Island. The majority of this habitat (80 percent) is located outside of the suitable timber base.

Red-breasted Sapsucker

The red-breasted sapsucker (*Sphyrapicus ruber*) is characterized as an early returning migrant in Southeast Alaska that prefers low volume, open stands of old growth (Hughes 1985).

The size of red-breasted sapsucker populations in an area is directly related to the quantity of snags. Nest trees range from 10 to 32 inches dbh, and although sapsuckers use smaller diameter trees, productivity appears to increase when larger diameter trees are available. Forest stands

over 2,000 feet in elevation are not considered valuable as habitat for red-breasted sapsuckers. Highest levels of use occur when patches of old growth are greater than 250 acres, and use declines to zero when patches of preferred habitat are less than five acres (Suring et al. 1993b).

The red-breasted sapsucker model evaluates breeding habitat capability based on habitat type and volume class. Results of this model indicate that high quality sapsucker habitat is extensive, occurring throughout the Project Area and encompassing all old-growth habitat (Volume Class 4-7) below 2,000 feet in elevation. High quality habitat is concentrated within the Project-defined Calder and Salmon Bay COGA's, primarily on Protection Head,.Mt. Calder/Mt. Holbrook LUD II, Red Lake, and the west side of Salmon Bay Lake. The model results, adjusted for patch size effectiveness, show a 15 percent decline in habitat capability from the pre-1954 level (Tables 3-73 and 74). Current high quality habitat represents approximately 40 percent of the Project Area, of which 32 percent is within Unmodified and Near-Natural Environment LUD's.

Hairy Woodpecker

Although hairy woodpeckers (*Picoides villosus*) are listed as uncommon residents throughout Southeast Alaska, sightings and sign were observed on numerous occasions within the Project Area. These primary cavity excavators require old-growth forest habitats with snags and partially dead trees for foraging and nesting. Optimum use occurs when patches of preferred habitat are greater than 500 acres. Use declines to zero when patches are less than ten acres (TLMP Draft Revision 1991a, Appendix B).

Winter roosting and foraging habitat are considered to be the limiting factor for resident cavity-nesting birds (Raphael and White 1984). Habitats used during the winter are below 1,500 feet elevation and are characterized by a high, dense canopy cover provided by large, widely spaced trees.

The habitat capability model indicates that high quality habitat for the hairy woodpecker is scattered throughout the Project Area and closely follows old-growth forest distribution. It is concentrated within the Project-defined Calder and Salmon Bay COGA's, primarily on Protection Head, Mt. Calder/Mt. Holbrook LUD II, Red Lake, and the west side of Salmon Bay Lake. Currently, the Unmodified and Near-Natural Environment LUD's provide approximately 44 percent of the high quality habitat that exists within the Project Area. Approximately 42 percent of the total high quality habitat has been harvested since 1954.

Incorporating patch size effectiveness, the model estimates a 48 percent decline from the pre-1954 level (Tables 3-73 and 74). Current high quality habitat represents approximately 27 percent of the Project Area.

Brown Creeper

The brown creeper (*Certhia americana*) forages almost exclusively on the trunks of trees in conifer forests (Morse 1970). They represent species dependent on high volume old-growth, and for brown creepers the tree size is more important than the tree species. Large diameter trees allow the birds to feed longer and capture more beetle larvae (their primary prey) per visit, as well as lessen their exposure during cold, windy weather.

Studies suggest that winter habitat is the limiting factor for cavity-nesting birds, including the brown creeper (Raphael and White 1984). Old-growth conifer stands below 1,500 feet elevation, and with greater than 20,000 board feet per acre are the preferred habitat. Optimum use occurs when high volume old-growth patches are greater than 15 acres, and use declines to zero when patches are less than one acre (Suring et al. 1993b).

Currently, the Unmodified and Near-Natural Environment LUD's provide approximately 30 percent of the high quality habitat in the Project Area. Since 1954, 63 percent of the total high quality brown creeper habitat has been harvested. Concentrations of habitat occur on Flicker Ridge, upper Buster Creek drainage (within the Draft Interim-designated Buster Creek HCA), and around Salmon Bay Lake, Red Lake, and the east side of Calder Bay (within Project-defined Calder COGA). High quality brown creeper habitat does not occur on Thorne Island.

The brown creeper model evaluates the capability of winter habitat based on successional stage and volume class. The model indicates a 60 percent decline in habitat capability from the pre-1954 level (Tables 3-73 and 74). Current brown creeper habitat represents approximately 12 percent of the Project Area.

Snag Density by Watershed

The TLMP Draft Revision (1991a) standards and guidelines call for maintenance of a minimum of 275 snags per 100 acres of forested habitat, averaged on a fourth-order watershed basis, to provide for cavity excavator species such as the hairy woodpecker and the red-breasted sapsucker. This retention level is expected to maintain viable cavity excavator populations throughout individual fourth-order watersheds as timber management activities cause fluctuations in the amount of forested acreage and thus snag densities. Most Project Area watersheds are not classified as fourth-order; therefore, analysis of snag density by third- and fourth-order watersheds was performed for this EIS. Analysis of third- and fourth-order watersheds indicates that estimated snag densities meet or exceed the recommended level in 34 of the watersheds (78 percent). The remaining ten (two fourth-order and eight third-order) watersheds are estimated to be at various levels below 2.75 snags per acres, due to previous harvest (Table 3-77).

Table 3-77
Snags Per Acre by Watershed (Estimated)

Watershed	Order	Commercial Forest Acres	Estimated Snags/Acre
A04A	3	380.10	5.59
A05A	3	1,954.24	2.92
A06A	3	160.76	6.78
A07A	3	282.67	6.53
A09A	3	307.47	**0.81**
A10A	3	370.59	**1.29**
A11A	3	1,228.04	3.40
A12A	3	1,608.46	**1.75**
A15A	3	1,314.00	3.22
A17A	4	6,166.28	4.32
A18A + A19B	4	13,393.13	4.06
A21A	3	618.74	**2.02**
A22A	3	1,175.46	2.97
A24A	3	411.34	4.45
A25A	3	1,093.22	3.34
A28A	3	4,914.65	3.97
A29A + New 3	4	7,898.22	4.20
A30B + A31C	4	4,904.78	3.95
A32B + A33C	4	6,313.68	4.57
A34B	4	1,947.00	4.73
A35C	4	5,108.24	4.21
A36D	4	3,068.88	4.95
A39B + A40C	4	2,333.59	4.09
A41A	3	980.31	**2.48**
A44A	3	746.94	**2.22**
A45B	4	2,143.45	4.49
A50A	3	483.15	6.29
A51A	3	2,101.94	4.24
A52A	4	9,953.47	**1.08**
A53A	3	131.19	7.82
A54A	4	1,996.37	**1.96**
A55A	3	1,240.32	**1.50**
A57A	3	2,201.21	**2.54**
A59A	3	2,907.41	4.26
A60A	3	3,098.31	3.42
A61A	4	2,958.36	4.54
A62A	3	767.04	4.22
AK4A	3	161.24	6.39
B29A	3	330.99	6.95
B30A	3	295.74	7.15
B31A	3	271.93	6.19
BD4A	3	344.80	6.36
NEW1	4	735.02	3.62
NEW2	3	136.13	5.60

Source: Confer and Hall 1994

NOTE: Bold type denotes < 2.75 snags/acre.

Assumptions:

1. Snags/Volume Class are based on Timber Stand Examination information gathered during the 1992 field season.
2. Volume Class 0 and 3 contain no snags of sufficient size to meet standards and guidelines.
3. Snags/Acre calculated as a weighted average based on commercial forest acres.
4. Harvest acres listed as VC 3 were field-verified as VC 4 acres and treated as such.

Biodiversity

Biological diversity (biodiversity) encompasses the variety of life in an area, including the genetic pools, species, plant and animal communities, ecosystems, and processes through which individual organisms interact with each other and their environments. Forest-wide standards and guidelines direct the planning and management for biodiversity by maintaining, in a healthy state, species of animals and plants historically native to Southeast Alaska (TLMP Draft Revision 1991a).

Because of the near impossibility of measuring and managing all species in a given area, managers often focus on a few key structural and functional features as indicators of overall species diversity (Swanson and Franklin 1992). Structural features identified as being critical to biological diversity in forests of the Pacific Northwest include coarse woody debris and large standing logs (Hansen et al. 1991). Following fire and other natural disturbances, snags, downed logs, and surviving large trees contribute structural complexity and promote plant and animal diversity in the forest stand. Because large trees and woody debris are more characteristic of old-growth forests, this forest type is more likely to contribute structural complexity to post-disturbance stands than are young or mature forests (Hansen et al. 1991). The frequency and severity of these disturbances shape landscapes by producing a mosaic of forest stands of differing age and size.

The challenge of providing for species at the landscape level is to manage for and maintain the area, pattern, and connectivity of habitats necessary to sustain them over the long term (Society of American Foresters' Task Force 1991). An important first step toward successful management of individual species is to determine the typical habitat requirement of the species and to provide a sufficient area of that habitat for the desired population (Hunter 1990). The ultimate goal of such an approach is to retain enough habitat for well-distributed populations. Strategies for maintenance of habitat to support viable populations are described in the following section.

Conservation Strategies

Maintaining viable, well-distributed populations of wildlife across the Forest landscape is required by the 1976 National Forest Management Act. A viable population is defined for planning purposes as one which has the estimated numbers and distribution of reproductive individuals needed to ensure its continued existence. Several strategies have been developed for maintaining habitats to support biodiversity and population viability. Under the TLMP (1979, as amended), the Ketchikan Area has identified old-growth habitat areas (retention and extended rotation) for wildlife and visual concerns. In the TLMP Draft Revision (1991a), a broader landscape approach was presented, based on ecological provinces as the area of management for maintaining population viability and biodiversity. Subsequently, an interagency committee convened to address the subject, resulting in a draft Environmental Assessment that proposes interim management guidelines. Each of these conservation strategies provides a different approach to maintaining viable populations, and presents a different level of risk to wildlife populations. Brief descriptions of these conservation strategies are presented below. In addition, a strategy for the maintenance of contiguous old-growth corridors, based on Project-specific analysis, is described. The 1996 TLMP Draft Revision addresses the issues of biodiversity and viable wildlife populations at the Forest-wide level. Once a Forest Plan Revision is adopted, it will provide direction for future implementation of conservation strategies.

TLMP 1979, as amended

TLMP (1979, as amended) does not contain specific habitat management standards or guidelines for maintaining habitat to support well-distributed, viable populations of goshawks, wolves, or other individual wildlife species. Rather, TLMP identified the need to set aside areas of operable commercial old-growth forest for the protection of old-growth dependent wildlife and fish species. These areas are called Old Growth Prescription, or Retention, areas. In addition to the Old Growth Prescription areas directed in TLMP, the 1989-1994 Long-Term Sale EIS (USDA Forest Service 1989c) provided for additional old-growth acreage to be managed to benefit wildlife through 2054 (the end of the first 100-year harvest rotation) in lands classified as follows :

- Inoperable commercial land
- Lands in extended rotation areas
- Lands in Aquatic Habitat Management old-growth prescriptions
- Lands reserved for recreation purposes

During the 1984-89 KPC operating period, a set of old-growth retention and extended rotation areas was tentatively identified by the Forest Service and ADF&G. A total of 18,035 acres of retention and 12,259 acres of extended rotation was identified, but the areas were never formally mapped for inclusion in the Forest Plan. Approximately 600 acres within the retention areas were harvested during the 1989-94 sale.

The extended rotation and retention areas were located primarily along the coast and the shorelines of large lakes in the Project area. The distribution of these areas provides four large blocks of old growth near the Mt. Calder, Calder Bay, Red Lake, and Salmon Bay Lake areas. The Mt. Calder and Calder Bay blocks appear as islands widely separated from the Red Lake and Salmon Bay areas. Patches of extended rotation identified at the outer perimeters of the Red Lake and Salmon Bay blocks create stepping stones of high quality habitat which tie the two blocks together. A stepping stone type corridor connects the Red Lake block to extended rotation areas in the El Capitan area to the south. No areas were identified in the central portion of the Project Area between Perue Peak and Red Lake, or on Thorne Island (Confer and Hall 1994).

The passage of TTRA in 1990 led to the protection of additional old-growth habitat, much of which was previously considered operable commercial forestland. The Mt. Calder/Mt. Holbrook and Salmon Bay LUD II areas were designated. These two areas encompass some of the identified retention and extended rotation areas, and expand the size of the Mt. Calder and Salmon Bay blocks. The no-harvest stream buffers mandated by TTRA protect additional old-growth acreage, but do not contribute substantially to the maintenance of old-growth travel corridors due to their north/south orientation.

Table 3-71 displays the acreage of old growth within the retention and extended rotation areas identified in the 1989-94 Long-Term Sale EIS. In addition, the acreage of old-growth habitat within the congressionally-designated LUD II areas is presented.

TLMP Draft Revision (1991a) Land Use Designation (LUD) System

Under the TLMP Draft Revision (1991a), a regional approach was used to address maintenance of population viability. The analysis area was defined as the Ecological Province. The Lab Bay Project Area lies entirely within the North-Central Prince of Wales Province. Areas within the Unmodified and Near-Natural environment LUD's, such as Beach Fringe and Estuary, LUD II, Special Interest Areas, and Wild/Scenic River, are expected to provide large blocks of habitat for wildlife. Landscape linkages, or corridors, allowing migration, travel, and genetic exchange would be provided by stream buffers. Under this strategy, individual project areas are not expected to independently maintain population viability, but to contribute to and not cause a decline of overall viable populations for the province. The TLMP Draft Revision (1991a) provides a detailed description of this approach to managing biological diversity.

In the Lab Bay Project Area, old growth habitat protected under the TLMP Draft Revision (1991a) LUD's is widely distributed. Two large blocks of old growth are protected within the congressionally-designated LUD II areas (Mt. Calder and Salmon Bay blocks). Three Special Interest Areas, designated for the protection of karst resources, include some old growth but are dominated by subalpine and alpine terrain. Beach Fringe and Estuary LUD's protect high value shoreline habitats; however, these are relatively narrow bands along the shoreline and do not provide much interior old-growth habitat. TTRA and no programmed harvest stream buffers provide protection along Class I and II streams. These buffers provide little or no interior old- growth habitat and most run in the north/south direction. Hence, they contribute little to the connectivity of the major old-growth habitat blocks at Mt. Calder and Salmon Bay, located in the southwest and northeast corners of the Project Area. Acres within these Land Use Designations are presented in Table 3-71.

Viable Population Committee Recommendations

In 1990, as part of the ongoing process for revising the Tongass Forest Plan, an Interagency Viable Population Committee (V-Pop) developed draft standards and guidelines for maintaining viable populations of old-growth dependent wildlife species (Suring et al. 1993a). These criteria were applied in mapping one type of proposed habitat conservation area (HCA) network. This "V-Pop Strategy" proposed the creation of large, medium, and small HCA's ranging in size from 1,600 to 40,000 acres. Small HCA's and travel corridors would be designated at the project-specific level. The primary objectives of the three HCA sizes and travel corridors are outlined below.

Large HCA's

Large HCA's are intended to ensure that populations of marten, boreal owls, goshawks, wolves, and brown bears would be secure. The objectives are:

1. Maintain large, contiguous tracts (minimum 40,000 acres) not more than 20 miles apart, including at least 20,000 acres of old growth with over 8 MBF per acre, which are capable of supporting viable populations of brown bears, female marten during winters of poor prey, northern goshawks, and boreal owls.

2. Areas within another TLMP Draft Revision (1991a) prescription (e.g., LUD II, Special Interest, etc.) may sometimes serve as a Large HCA.

Medium HCA's

These are intended to provide habitat for small, local populations that may be prone to local extinctions. The medium HCA's should be located close enough to the Large HCA's or to other Medium HCA's for recolonization to occur. The objectives are:

1. Retain minimum 10,000-acre tracts, not more than 8 miles from another Medium HCA, containing at least 5,000 acres of old-growth forest. Tracts should be capable of supporting viable populations of northern goshawks, boreal owls and female marten during winters of poor prey. HCA's that are somewhat circular are preferable to linear ones because of the smaller area of edge habitat.

2. Areas within another TLMP Draft Revision (1991a) prescription (e.g., LUD II, Special Interest, etc.) may sometimes function as a Medium HCA.

Small HCA's

Small HCA's provide functional habitat for animals dispersing between Large and Medium HCA's and ensure that species of concern have a high likelihood of occurring in each third-order watershed at least on a temporary basis. The objectives are:

1. Maintain within each major watershed one small HCA (minimum 1,600 acres), including at least 800 acres of old growth forest with over 8 MBF per acre. Tracts should be capable of supporting at least one female marten during winters of poor prey and 20 to 40 flying squirrels.

2. Small HCA's would be designated at the project level. Lands not suitable for timber harvest, existing buffers, and other lands removed from the timber base should be used to the extent practicable for small HCA's.

Travel Corridors

The V-Pop Committee recommended that old-growth travel corridors be retained to increase the likelihood of species dispersal throughout the landscape. Corridors would include old-growth habitat within LUD's where harvest would not occur, including beach fringe and estuary buffers, and the No Commercial and No Programmed harvest components of the Stream and Lake Protection LUD. These corridors would aid in the dispersal of old-growth associated species. Additional corridors may have to be designated on a project level. Breaks in old growth corridors should not exceed 65 feet to ensure that flying squirrels can glide across the openings.

The mapped application of the Committee's strategy includes two medium HCA's within the Lab Bay Project Area encompassing the Salmon Bay and Mt. Calder/Mt. Holbrook LUD II areas.

Draft Interim Management Guidelines

Review of the V-Pop HCA strategy, peer review findings, goshawk workshop recommendations and other recent information is ongoing. For the interim, the Forest Service has developed draft habitat management guidelines for maintaining wildlife viability on the Tongass National Forest (USDA Forest Service 1994b). This draft interim strategy proposes large and medium HCA's and includes specific requirements for the size, composition, and spacing of large (≥40,000 acres in size) and medium (≥10,000 acres) HCA's, as described in the V-Pop strategy. Harvesting of old-growth forest would be deferred within the HCA's, unless an alternative or modified HCA fully meeting all design criteria is first designated. Some second-growth harvest may be permitted and new roads would be located outside HCA's as much as possible. In addition to the designated large and medium HCA's, commercial harvest would be deferred within a 20-30 acre area around goshawk nest sites for pairs identified in 1994 or later, or within the estimated home range for pairs identified prior to 1994. Refer to Threatened, Endangered, and Sensitive Species section on goshawks for a more detailed discussion of goshawk interim guidelines.

Under the draft interim guidelines, two medium HCA's would be designated within the Lab Bay Project Area (Figure 3-14). The Salmon Bay HCA, totaling 9,737 acres, follows the boundary of the Salmon Bay LUD II area. The Buster Creek HCA, located in the northern portion of the Project Area, totals 8,784 acres (Table 3-78). The draft interim guidelines also include the northern portion of a goshawk home range, encompassing the southeastern portion of the Project Area's mainland and Thorne Island.

Table 3-78

Total Acreage and Old-Growth Acreage Proposed Under Draft Interim Management Guidelines

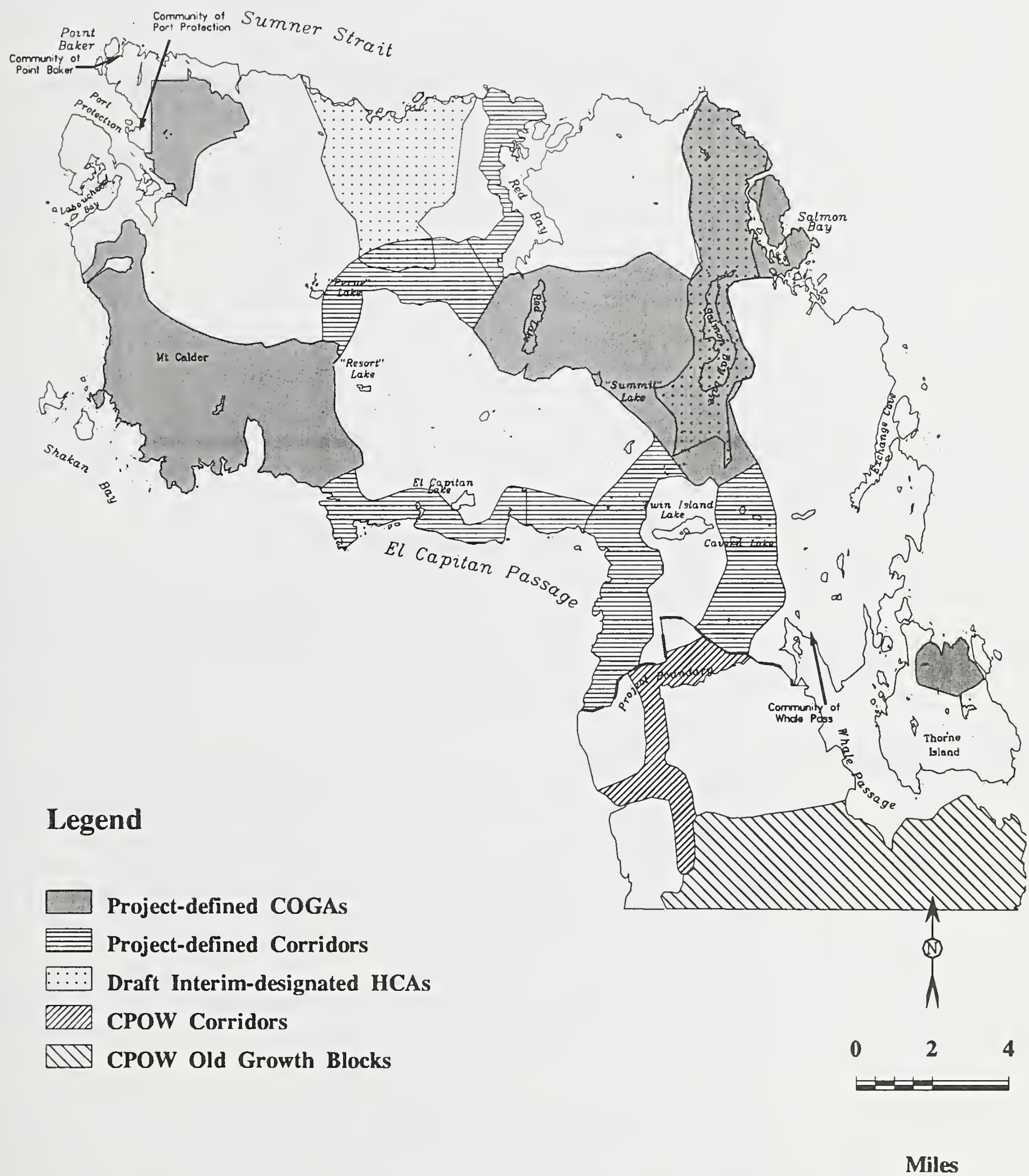
HCA	Total Acreage	Old-Growth Acreage	Percent of HCA Comprised of Old Growth
Salmon Bay	9,737	4,232	43
Buster Creek	8,784	3,705	42
Total	**18,521**	**7,937**	**43**

Source: Ketchikan Area GIS

Project-defined Contiguous Old Growth Area Strategy

As part of the ID Team's site-specific analysis of the Project Area current condition, contiguous old growth management areas (COGA's) were developed that meet the V-Pop recommendations for maintaining viable populations of old-growth dependent wildlife species. The intent of this effort was to identify specific old-growth management areas that would best provide for maintenance of old-growth dependent species based on detailed field investigation and analysis of the Lab Bay Project Area. Using site-specific information, two medium-sized Project-defined COGA's are proposed within the Salmon Bay and Mt. Calder areas. In addition, two small COGA's (Thorne Island and Port Protection) are proposed within the Project Area (Figure 3-14). Table 3-79 displays the total and old-growth acreage within each Project-defined COGA. Five travel corridors were also proposed where harvest would occur on a 195-year rotation schedule. The Project-defined COGA's and travel corridors generally included the eight contiguous old-growth blocks described in the Affected Environment section. Maintenance of small COGA's and travel corridors is considered critical since old-growth habitat within the Lab Bay Project Area cur-

Figure 3-14
Draft Interim-designated HCA's and Project-defined COGA's and Corridors



Source: Ketchikan Area GIS

rently consists of individual old-growth patches surrounded by a matrix of early-successional forested and nonforested areas. This is especially evident in the southeastern portion of the Project Area which consists of large harvested areas interspersed with open, naturally fragmented, nonforested areas. The two Project-defined corridors proposed within this area are intended to provide a future travel link between the Lab Bay and CPOW Project Areas.

Table 3-79

Total Acreage and Old-Growth Acreage Proposed Under the Project-Defined COGA Strategy

COGA	Total COGA Acreage	Old-Growth Acreage	Percent of COGA Comprised of Old Growth
Salmon Bay COGA	24,608	12,748	52%
Mt. Calder COGA	17,381	12,639	73%
Port Protection COGA	3,608	2,374	66%
Thorne Island COGA	1,343	755	56%
Total	**46,940**	**28,516**	**61%**

Source: Ketchikan Area GIS

Effects of the Alternatives

This analysis considers the direct, indirect, and cumulative effects of the alternatives proposed for the Lab Bay Project. Effects are projected to 2004 (Alternative 2), the end of the KPC contract and the anticipated end of the current proposed action; and to 2054, to show the cumulative impacts of past, proposed, and scheduled harvest generally corresponding to the conversion of old growth to second growth management.

Wildlife Habitats

Wildlife species are individually adapted to combinations of plant community types and successional stages. Changes in plant communities or successional stages may result in changes in animal communities. Generally, the more diverse the vegetation, the greater the variety and abundance of wildlife species in an area. The probability of maintaining viable populations increases if suitable habitat is present in sufficient types, amounts, and spatial arrangements on a landscape level. Changes in forest cover types or successional stages occur as a result of natural and human caused disturbance. Timber harvest may add to, or detract from, the diversity of an area depending on existing conditions and the type and amount of harvest planned.

The effects of the proposed alternatives differ for various groups of wildlife in relation to their habitat requirements, feeding habits, and interaction with humans. This EIS uses Management Indicator Species and Threatened, Endangered, and Sensitive species that are potential inhabitants of the area to evaluate the proposed alternatives.

Timber harvest and road construction are the principal activities that would generate direct, indirect, and cumulative effects on wildlife in the Lab Bay Project Area. Effects on wildlife from trapping, hunting, and recreational activities are indirectly tied to the type and magnitude of timber harvest. Timber harvest and road construction have the potential to affect wildlife resources through (1) habitat alteration, (2) disturbance from project activities, and (3) increased post-harvest human access. Greater public access in turn increases the vulnerability of game animals to hunting and of furbearers to trapping, and may cause shifts in traditional use patterns.

Forest Successional Habitats

The Affected Environment section describes the forest successional habitats currently found within the Lab Bay Project Area. The effects of habitat loss on old-growth dependent species are reflected in the Management Indicator Species discussion presented later in this section.

The proposed units would begin to recover their old-growth characteristics approximately 150 years after harvest. However, the average rotation age for harvested stands would be 100 years, with stands located on less productive sites requiring a longer rotation (up to 150 years) to reach a desirable merchantable volume. It takes 150 to 200 years before even-aged stands begin to develop a more uneven-aged forest composition and heterogeneous understory (Alaback 1984). Considerably more time is required to develop snags and large accumulations of large diameter woody debris in various stages of decomposition. Three hundred or more years may be required to create old growth on productive sites and less productive sites may take even longer. Since it can be assumed that the managed stands within the Lab Bay Project Area would be reentered and harvested as second growth, these forest stands would never develop the amount of decadent and dead material typically associated with old-growth forests (TLMP Draft Revision 1991a). Additionally, understory production would remain low up to the time of the second harvest. However, the proposed retention of structure within managed stands would continue to provide some of the characteristics exhibited in old-growth forests (see Effects on Snag Density).

The typical harvest method within the Project Area is clearcut harvest. Current conditions would change as a maximum 3,910 acres (Alternative 2) and a minimum 1,823 acres (Alternative 6) of old-growth habitat is converted to an early-successional stage under Type A through F silvicultural prescriptions (Table 3-80). Structure, in the form of groups of snags with little rot and green-tree replacements, would be retained within each unit harvested under Types A through F to increase wildlife and visual values. In addition, up to 640 acres (Alternative 2) would be harvested under Type G through I silvicultural prescriptions. These harvest units would have the appearance of partial cuts, with Type I harvest retaining the highest level of structure.

Table 3-80
Proposed Silvicultural Treatments

Silvicultural Treatment	Harvest Type	Percent Volume Retained	Percent of Acres Proposed for Harvest: Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Type A	Clearcut	0%	9%	12%	10%	10%	9%
Type B	Clearcut	5%	27%	31%	27%	24%	32%
Type C	Clearcut	0%	4%	4%	12%	3%	15%
Type D	Clearcut (strip or group)	5-50%	37%	34%	31%	41%	26%
Type E	Overstory Removal	10%	4%	4%	5%	6%	9%
Type F	Seed Tree	10%	5%	6%	7%	5%	5%
Type G	Shelterwood	30%	4%	6%	3%	3%	1%
Type H	Shelterwood	50%	0%	0%	0%	1%	0%
Type I	Group/Single Tree Selection	40-75%	10%	3%	5%	7%	3%
Total Acres			**4,549**	**3,040**	**2,919**	**3,106**	**1,885**

Source: Ketchikan Area GIS

Under Alternatives 4 and 6, 218 acres of old growth would be harvested from Thorne Island using an uneven-aged management plan. Suitable and available timber would be harvested on a 150-year rotation, with entries scheduled every 15 years. A 195-year rotation is proposed for suitable lands within the beach fringe. Harvest settings would be two acres in size, and distributed across the harvestable area. Helicopter yarding to barges is proposed, minimizing distur-

bance to wildlife habitat. This management plan should maintain the functions and values of old-growth habitat on Thorne Island, as the two-acre openings would mimic naturally-occurring openings in the forest. Alternatives 2, 3, and 5 propose conventional harvest methods on Thorne Island. Under these alternatives, 619 acres of old-growth habitat would be harvested and approximately 15 miles of road would be constructed. The typical method of harvest would be clearcut with two yellowcedar trees per acre retained within each unit.

In addition, up to 233 acres of old-growth habitat would be cleared as a result of road construction for the Lab Bay Project (Alternative 2). This represents approximately 33 percent of the total acres that would be cleared for roads. As described in the Transportation section, these roads would provide access for future timber harvest entry; therefore, regeneration of old-growth characteristics would not occur.

Special Wildlife Habitats

Implementation of the Action Alternatives would result in some harvest of special wildlife habitats. Site-specific information has been used to design harvest units, ensuring implementation of legislated protective measures, Forest-wide standards and guidelines, Best Management Practices (BMP's), and unit-specific mitigative measures. Through this process, adverse effects to remaining acreages of special wildlife habitats are reduced or eliminated.

Beach Fringe and Estuary

No harvest is planned within the 500-foot Beach Fringe or 1,000-foot Estuary Fringe LUD's, with the exception of Alternatives 4 and 6, which propose harvest of 36 acres within the beach fringe on Thorne Island, under the uneven-aged management plan. Construction of roads through these beach fringe and estuary LUD's would result in clearing of a maximum of approximately 7 acres under Alternative 2 (Table 3-81).

Riparian

For this analysis, riparian habitat was identified by the boundaries of the Riparian Management Area, as defined in the Stream and Lake Protection LUD. No harvest would occur within the 'No Commercial' harvest component of the LUD, as required by TTRA (1990). No harvest is planned for the 'No Programmed' harvest component. However, construction of roads through these components of the LUD will result in clearing of approximately 15 acres (Alternative 2). A maximum of 391 acres (Alternative 2) is scheduled for harvest within the 'Selective' harvest and 'Planning Level' components of the LUD (i.e. components in which harvest is allowed), in accordance within the Stream and Lake Protection LUD guidelines. Approximately 98 additional acres (Alternative 2) would be cleared for the construction of roads in these two buffer components (Table 3-81). (Refer also to Floodplains, Wetlands and Riparian Areas section.)

Table 3-81
Acres of Special Wildlife Habitats Affected by Proposed Harvest and Road Construction, by Alternative

	Beach Fringe and Estuary		Riparian Management Areas	
Alternative	Acres Harvested	Acres Roads	Acres Harvested	Acres Roads
Past Harvest	3,126	256.6	4,185	470
2	—	7.3	391	98
3	—	3.7	259	63
4	36*	3.6	264	52
5	—	5.8	258	63
6	36*	0.4	141	26

Source: Ketchikan Area GIS

* Thorne Island Uneven-aged Management Plan

Old-Growth Forest

Total acres of old growth harvested under each action alternative is shown on Table 3-80. No significant effects on the local wildlife populations within the Lab Bay Project Area are likely to occur as a result of old-growth harvest by plant series, since none of the action alternatives propose to harvest greater than five percent of the old-growth acreage within each series. Harvesting would not change the potential climax plant community that can be achieved on a particular site. However, timber harvest and associated road construction would change the current plant community successional stage as described earlier in this section (Forest Successional Habitats).

Spatial Distribution of Old Growth

TLMP 1979, as amended

TLMP (1979, as amended) identified the need to set aside areas of operable commercial forestland for the protection of wildlife and fish requiring old-growth habitat for their survival. Old growth retention and extended rotation areas were tentatively identified by the Forest Service and ADF&G. Although these areas were never formally mapped, the tentatively identified areas were used to analyze the anticipated effects of timber harvest on this strategy. Table 3-82 displays the acres of old growth that will remain within the retention and extended rotation areas after implementation of the action alternatives.

Table 3-82
Old Growth Acreage within Retention / Extended Rotation, Existing Condition and by Alternative

		Alternatives				
	1995	2	3	4	5	6
Retention	17,435	16,663	17,148	16,872	16,897	17,169
Extended Rotation	12,259	11,745	11,808	11,995	11,820	11,981
Total	**29,694**	**28,408**	**28,956**	**28,867**	**28,717**	**29,150**

Source:

TLMP Draft Revision (1991a)

The designation of Unmodified/Near-Natural LUD's in the TLMP Draft Revision (1991a) was intended (in part) to protect large old-growth areas and corridors in a network of habitat, while allowing multiple uses in other LUD's. This approach was based on the assumption that the no-harvest LUD's contained sufficient old growth to maintain biodiversity and sustain minimum viable populations of old growth-dependent wildlife species.

Table 3-83 displays the acreage of old growth within the Project Area LUD's and the old-growth acreage remaining under each action alternative. Timber harvest is not proposed within LUD's in the Unmodified/Near Natural environments.

Table 3-83
Old Growth Acreage Pre-harvest and by Alternative

	Pre-1954	1995	Alternatives 2	3	4	5	6
Unmodified/Near Natural LUD's[1]	**29,585**	**24,963**	**24,963**	**24,963**	**24,963**	**24,963**	**24,963**
Modified/Highly Modified LUD's							
Stream and Lake Protection LUD[2]	11,201	8,135	7,775	7,904	7,902	7,897	8,014
Timber Production	43,216	26,511	24,292	24,895	24,885	25,292	25,371
Modified Landscape	21,358	13,351	11,990	12,450	12,675	12,213	12,826
Scenic Viewshed	7,814	6,004	5,770	5,984	5,935	5,770	5,999
Total Modified/Highly Modified LUD's	**83,589**	**54,001**	**49,827**	**51,233**	**51,397**	**51,172**	**52,210**

Source: Ketchikan Area GIS

[1] TLMP Draft Revision (1991a) LUD's.

[2] Selective Harvest and Planning Level components.

The 1996 TLMP Draft Revision proposes a new land use designation, the Old-Growth LUD, to protect old-growth habitat in support of viable populations of wildlife. Implementation of this proposal would result in additional acreage of old-growth maintained within the Unmodified and Near Natural LUD categories.

Contiguity, Fragmentation and Connectivity

Conversion of old-growth to early-successional stage forest outside the no-harvest LUD's would fragment the existing old-growth landscape, resulting in a reduction in the total area of habitat available and segregation of the remaining habitat into isolated patches (Wilcove et al. 1986). The anticipated duration of isolation, the distance between patches, and the degree of connectivity between them can dampen or intensify the effects of fragmentation on wildlife.

When timber harvest results in the isolation of an old-growth patch in the surrounding forest matrix, the patch may become the only area of suitable habitat for displaced species. This may lead to the concentration of terrestrial species within the patch. Competition and predation would increase, resulting in decreased reproductive potential. The most rapid local extinctions would be likely in species that depend primarily on old-growth interior habitat, such as marten, and those that require large territories, such as the black bear and Queen Charlotte goshawk.

Since timber harvest is not proposed under Alternative 1 (no action), the eight identified blocks of old-growth forest described in the Affected Environment section would be altered only through natural disturbances such as windthrow or landslides, or by activities other than those associated with the Lab Bay Project. Under Alternatives 2, 3, and 5, the old-growth blocks would be affected through fragmentation and reduction in size resulting from timber harvest and road

construction. A minimal effect on large old-growth tracts would be expected under Alternative 4, since harvest is proposed outside of the Project-defined COGA's which encompass a large percentage of the identified old-growth blocks. Under Alternative 6, entry into large currently unfragmented old-growth tracts (COGA's) would be minimized by placing harvest units at their outside edges.

Old Growth Patch Size Frequency and Effectiveness

Changes in the existing interior old-growth patch size and frequency as a result of the proposed alternatives are displayed in Table 3-84 and Figure 3-15. If a patch became bisected by a harvest unit, it was documented as two separate patches of different core and total acreage.

As the histograms in Figure 3-15 show, the action alternatives would increase the number of smaller-sized patches and decrease the number of larger patches. The distance between patches also increases, especially in areas already heavily fragmented, such as east Red Bay. Figure 3-16 illustrates the size and distribution of old-growth patches resulting from Alternative 2 (maximum harvest alternative). Alternatives 3, 4, 5, and 6 are displayed in Appendix K. Table 3-84 compares the interior area to total patch area ratios under each alternative. The most compact patch shapes remaining after timber harvest resulted in the highest ratio values. Patches with elongated shapes, indented rather than entire unbroken perimeters, with or without inclusions of open habitat resulted in a low ratio of core area to total patch area, because of the high percentage of edge habitat in these patches.

Table 3-84
Ratios of Interior Area to Total Patch Area by Alternative

Interior Patch Size Range (acres)	Pre-1954	Current	Average Patch Ratio Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
<1	-	0.02	0.02	0.02	0.02	0.02	0.02
1-10	0.22	0.14	0.13	0.13	0.13	0.13	0.14
11-50	0.41	0.30	0.29	0.29	0.29	0.29	0.29
51-100	0.52	0.42	0.40	0.40	0.40	0.40	0.41
101-1000	0.64	0.53	0.50	0.51	0.51	0.52	0.52
1001-10,000	0.67	0.59	0.55	0.59	0.55	0.55	0.59
>10,000	0.74	0.64	0.59	0.60	0.62	0.59	0.62

Source: Ketchikan Area GIS

Figure 3-15
Old-Growth Patch Size Frequency, Pre-harvest, and by Alternative

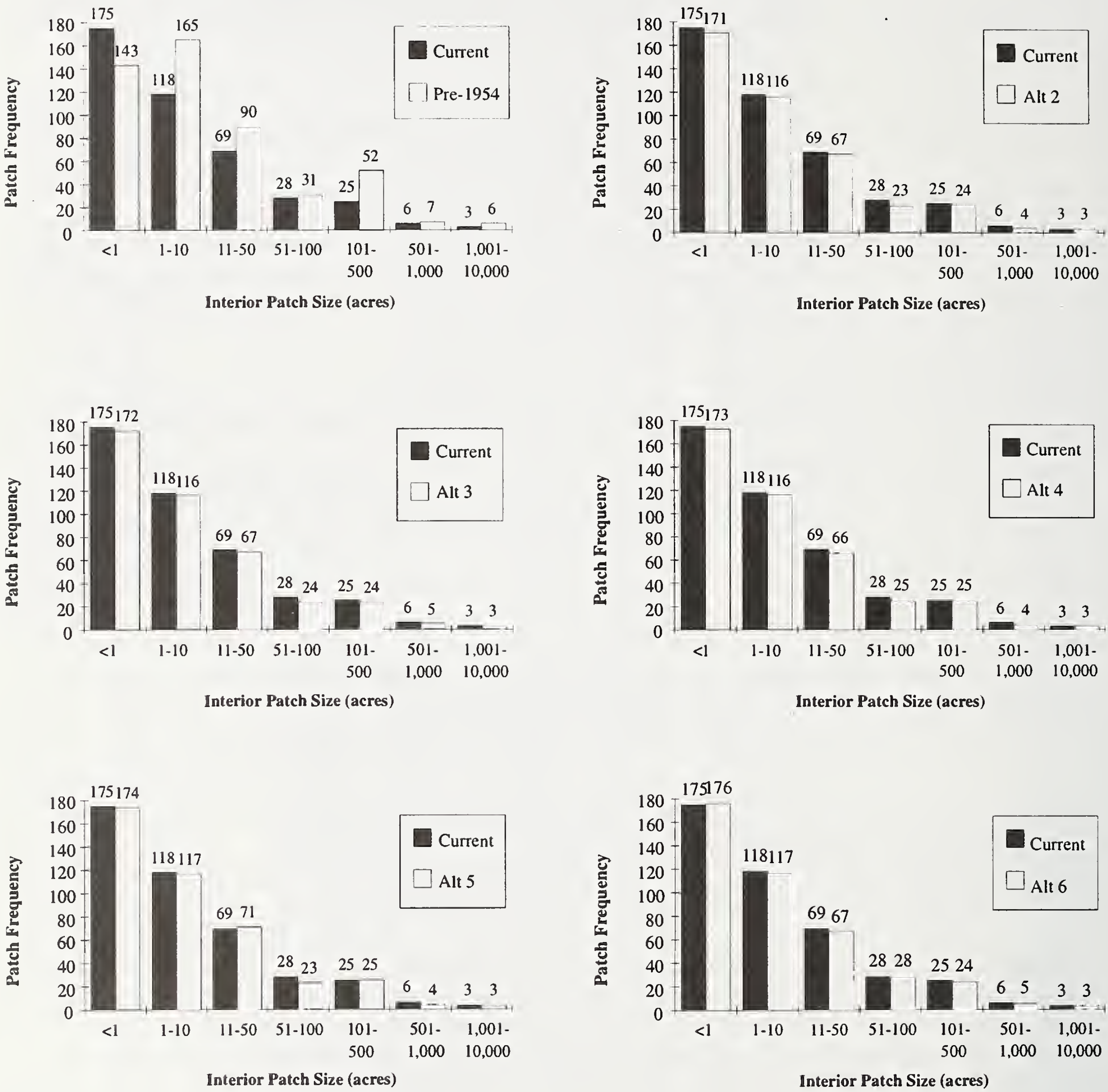


Figure 3-16
Old-Growth Patch Map for Alternative 2

Source: Ketchikan Area GIS

Management Indicator Species (MIS)

As discussed in the Affected Environment section, the TLMP Draft Revision (1991a) MIS models were used to estimate the capability of habitats to support selected species. The model results are intended to provide a relative comparison between effects of the alternatives, not to predict actual population numbers. In keeping with the intended use of the model data, Final EIS tables and figures displaying the habitat capability model results have been modified to show only the relative habitat capability, expressed as a percentage of the 1954 (prior to commercial harvest) capability.

The recently published 1996 TLMP Draft Revision has discontinued use of habitat capability models, with the exception of a modified deer model. The modified deer model has been analyzed for the Lab Bay Project, and the results are presented in Appendix P. The revised deer model showed results similar to the earlier model for the Project Area. For other species, the 1996 TLMP Draft Revision incorporated species assessments prepared by expert panels to document expected effects of implementation of the proposed Forest Plan revisions. Although the assessments were prepared on a Forest-wide, rather than Project-specific basis, they predict effects that are consistent with those described in this EIS for the Lab Bay Project.

The TLMP Draft Revision (1991a) models were analyzed by GIS using a 20-acre grid system to determine existing conditions for each species. To obtain more site-specific information, the models were rerun for each unit using a one-acre grid system. A patch size analysis has been incorporated into the modeling effort for black-tailed deer, marten, hairy woodpecker, red-breasted sapsucker, and brown creeper.

Table 3-85 displays the expected changes in MIS habitat capability, expressed as a percentage of current condition (1995) habitat capability. Implementation of Alternative 1, the No Action Alternative, would not directly affect habitat capabilities for any MIS. The percent reduction in habitat capability from the current condition for MIS species under the action alternatives would vary from less than one percent to a maximum of seven percent (Table 3-85). Alternative 2 would cause the greatest reduction in habitat capability for all species. Habitat capable of contributing to the support of viable populations in the Lab Bay Project Area would be adequately maintained under each alternative.

Increased access could intensify harvest of marten, black bear, Sitka black-tailed deer, and gray wolf through increased pressure from hunting and trapping. Since the Project Area is accessible from communities on Prince of Wales Island via the road system, and from other Southeast Alaska communities via the Alaska Marine Highway System, some roads are recommended for closure upon completion of the timber sale to mitigate potential effects of increased hunting pressure. Closed roads would continue to be accessible to hikers and bicyclists, and in some cases ATV's, and therefore disturbance would not be reduced to pre-harvest levels. Recommended closures were made on a road-by-road basis depending on public input, resource values, and other management activities. Public input was solicited on the access management plan during public hearings on the Draft EIS. Roads proposed for closure would be closed under all alternatives. Table 3-86 displays existing and proposed miles of road by WAA for the Project Area and final road density after closures.

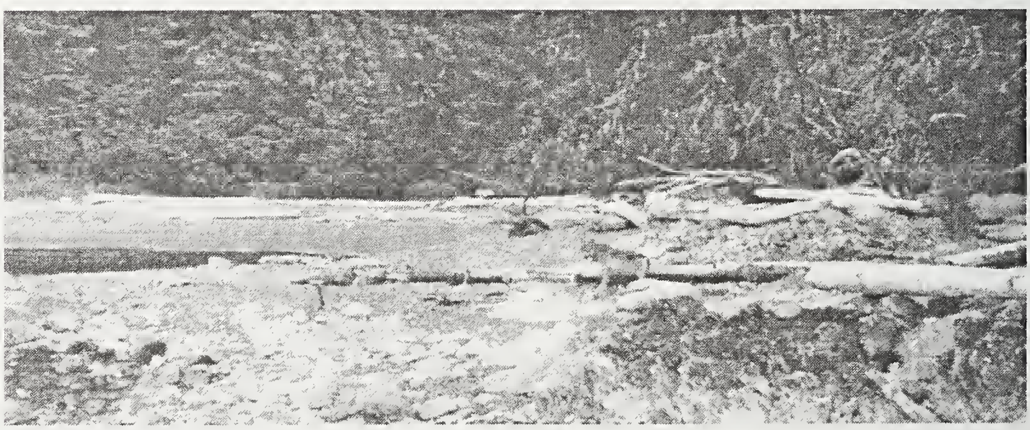


Table 3-85
Changes in Estimated MIS Habitat Capability by Alternative (% of 1995 HC)

Species	Percent of 1995 2	3	4	5	6
Black-tailed Deer[1]	97.9%	98.5%	98.8%	98.7%	98.9%
Black Bear	99.3%	99.7%	99.7%	99.7%	99.7%
Gray Wolf[2]	97.4%	98.0%	98.7%	98.7%	98.7%
Marten[1]	95.9%	97.1%	97.5%	97.1%	98.8%
River Otter	100.0%	100.0%	100.0%	100.0%	100.0%
Bald Eagle	100.0%	100.0%	100.0%	100.0%	100.0%
Vancouver Canada Goose	96.4%	97.5%	97.8%	97.5%	98.6%
Red-breasted Sapsucker[1]	94.3%	96.0%	96.5%	96.2%	97.8%
Hairy Woodpecker[1]	94.0%	96.1%	97.0%	96.2%	97.5%
Brown Creeper[1]	95.8%	97.9%	98.1%	97.0%	99.1%

Source: Planning Record

1 Values have been adjusted for patch size effectiveness.

2 Wolf values are based on deer values adjusted for patch size effectiveness.

Table 3-86
Effects to Road Density by WAA

WAA	Existing Miles of Open Road	Existing Open Road Density	Alt 2 Miles of Proposed Roads	Alt 2 Open Road Density	Miles of[1,2] Proposed Closures	Alt 2[3] Open Road Density After Closures
1527	61.4	1.1	7.4	1.2	7.4	1.1
1528	23.1	0.6	6.0	0.8	8.9	0.5
1529	120.8	1.1	37.3	1.4	63.3	0.9
1530	103.6	1.7	27.2	2.1	48.9	1.3
Project Area[4]	**308.9**	**1.15**	**77.9**	**1.44**	**128.5**	**0.96**

Source: Ketchikan Area GIS

1 Miles of new road to remain open is similar under all action alternatives, 2.53 (Alternative 3 and Alternative 6) to 3.32 (Alternative 2 and Alternative 5) miles.

2 Closures of existing roads are the same under all action alternatives.

3 Road densities, after implementation of closures, would be 0.96 for all action alternatives.

4 Project Area includes state, private, and encumbered lands.

Direct effects to black bear, otter, and bald eagle have been reduced in all action alternatives through avoidance of timber harvest in beach fringe, estuary fringe, riparian, soils and alpine/subalpine habitats. The acres of harvest affecting high quality MIS habitat is displayed in Table 3-87.

Table 3-87
Acres of Proposed Harvest within High Quality Habitat[1], by Alternative

	Alternative				
Species	2	3	4	5	6
Black-tailed Deer[2]	1,136	514	513	776	201
Black Bear	4,545	3,040	2,760	3,099	1,721
Marten	3,216	2,184	1,857	2,228	1,092
River Otter	36	10	33	22	2
Bald Eagle	22	6	21	15	2
Canada Goose	277	205	181	190	93
Sapsucker	3,932	2,645	2,334	2,697	1,463
Hairy Woodpecker	2,512	1,496	1,349	1,768	858
Brown Creeper	776	357	319	555	132

Source: Ketchikan Area GIS

1 Habitat Suitability Index (HSI) greater than or equal to 0.5, based on Habitat Capability Models.

2 Wolf populations are tied to Sitka black-tailed deer habitat values.

Sitka Black-tailed Deer

During severe winters Sitka black-tailed deer are dependent on low elevation, high volume, old-growth stands. Typically, the long-term quality of deer winter range is reduced by timber harvest. Clearcuts and second growth provide little snow interception above forage and, therefore, greatly increase effects of snow. Even in unlogged conditions, a deep-snow winter can kill many deer.

The size reduction and fragmentation of winter range patches, particularly those less than 1,000 acres, reduces the hiding cover of the patch, and as edge habitat increases, the thermal quality decreases. Within the Project-defined Calder Medium COGA, Units 528-250, -251, 531.1-208, -213, -230, and -257 are within high quality deer winter range. Units 527-206, -226, and 529-270, that are within the Project-defined Port Protection Small COGA, occur within a contiguous patch of high quality winter range. Units 532-228 and -229 are situated in a patch of high quality winter range in the Project-defined Red Bay Corridor. Harvest of these units would result in increased fragmentation of contiguous patches of high quality winter range. In addition, units such as 527-227, -228, -229, 534.0-225, -226, and -228, would no longer function as quality winter range habitat. Travel corridors within Units 527-224, 528-212, 529-270, 529-286, 531.1-221, 532-229, 533-248, -249, -250, -251, 538-208, and 540-223 would no longer have adequate cover to be quality travel corridors. Use of forage areas would be restored within approximately five years and would last approximately 20 to 25 years until the canopy closes. Increased use as travel corridors could be expected to increase as habitat is reestablished, as early as 50 years after harvest.

Up to 1,136 acres of the proposed harvest is within high quality deer winter range (Table 3-87). The direct effect of harvesting high quality habitat, in conjunction with the indirect effect of increasing fragmentation is a reduction of up to 2.1 percent in habitat capability (Table 3-85).

Road density within the Project Area would increase from the current level of 1.15 to between 1.26 (Alternative 6) and 1.44 (Alternative 2) miles per square mile, for the duration of harvest activity. Increased road densities may displace deer from preferred habitats and hunter success may increase with improved access. No specific recommendations exist for Southeast Alaska; however, black-tailed deer models developed in Washington indicate that road densities should be maintained below 2.5 miles per square mile to maintain habitat capability (Washington Department of Wildlife 1987).

Depending on the alternative selected, between 74.6 (Alternative 2) and 28.7 (Alternative 6) miles of newly constructed road are proposed for closure following completion of harvest activities. This would leave between 3.3 (Alternative 2) and 2.5 (Alternative 3 and Alternative 6) miles of newly constructed road open after harvest completion. This, in addition to closures of existing roads, would result in post-harvest road densities of 0.96 miles per square mile within the Project Area under all alternatives (Table 3-86).

Structure would be retained at some level in all harvest units (see Table 3-80). By retaining structure within harvest units, particularly those with Harvest Types G, H, and I where 30 to 75 percent of the volume would be retained, additional snow interception would be provided within regenerating units and would maintain greater structural diversity within the second-growth stands. Over the long term, old-growth characteristics may develop at a younger stand age in units where structure was retained.

Harvest units that are thinned prior to initial canopy closure may extend the stand's short-term ability to provide forage. Recent studies indicate that thinning of second-growth stands prior to canopy closure prolongs the availability of preferred forage species (DellaSala et al. 1993). Over the short-term, thinning second-growth would result in a more open canopy, increased snow accumulation, and a decline in winter habitat value for deer (Sigman 1985). However, over the long term (greater than 100 years), repeated thinning in managed stands may promote old growth structure, such as a multilayered canopy and large diameter trees (FEMAT Report 1993). Criteria have been developed that prioritize thinning of existing second growth stands on the Project Area (See Silviculture section). Additional units proposed for harvest that have been identified as high priority for future thinning, in part, due to their location in high quality winter range stands of Volume Class 6 and 7, are listed in Table 3-88. Refer to the Silviculture section for a discussion of criteria that could be used to identify and select existing second-growth stands for precommercial thinning.

Table 3-88
Proposed Thinning Units

	Alternative					
Unit	1	2	3	4	5	6
527-224		X		X	X	
527-226		X			X	
527-229		X		X	X	
531.1-257		X			X	

Source: Ketchikan Area GIS

Black Bear

Black bears use all habitat types, therefore all harvest units lie partially or wholly within high quality habitat (Table 3-87). No effects on black bear habitat capability are expected due to the lack of harvest within beach fringe, estuary fringe, stream corridors, and riparian habitat under all alternatives (Table 3-85). Clearcuts would be expected to provide forage until the canopy

closes, usually at 20 to 25 years, with tree cambium available for foraging continuing until the stands are about 40 year of age. Recent studies indicate that thinning of second-growth stands prior to canopy closure prolong the availability of preferred forage species (DellaSala et al. 1993). Although not reflected in the habitat capability model, areas that have been heavily harvested in the past, such as in WAA 1529 and 1530, are currently limited in available cover. Timber harvest within these WAA's would further reduce habitat capability by increasing the size of existing openings. In areas not limited by available cover, timber harvest would increase acres of early successional habitat, providing high quality spring and summer foraging sites. Bear dens in Units 532-228 and 529-282 would become unsuitable due to the lack of cover.

Road density within the Project Area would increase to between 1.33 and 1.44 miles per square mile for the duration of harvest activities. As described in the Subsistence section, additional road access would affect black bear populations by increasing hunter success (Kolenosky and Strathearn 1987). Road density in the Project Area, after implementation of closures, would be reduced to 0.96 mile per square mile (Table 3-86).

Gray Wolf

The Alexander Archipelago wolf is closely linked to the Sitka black-tailed deer, its primary prey species, therefore a decline in deer habitat capability may subsequently affect wolf populations. Timber harvest proposed under the action alternatives would result in habitat capability values displayed in Table 3-85.

It is recommended that road densities be maintained below 1.0 mile per square mile, since wolves are believed to be intolerant of road densities exceeding this threshold. Suring et al. (1993b) states that wolf populations are extremely vulnerable to harvest when road densities approach 0.93 miles per square mile. The TLMP Draft Revision (1991a) sets 1.0 mile per square mile as the threshold for the implementation of protective measures within a WAA. WAA's 1527, 1529, and 1530 currently exceed the 1.0 mile per square mile threshold (Table 3-86). After completion of harvest, road density would be reduced in WAA's 1528, 1529, and 1530 to below current conditions through closure of new and existing roads. Within WAA 1529, closures would reduce road density below the 1.0 mile per square mile threshold. In WAA's 1527 and 1530, after recommended closures, road densities would continue to exceed 1.0 mile per square mile (1.1 and 1.3 miles per square mile, respectively). Within these WAA's, a high percentage (49 percent in WAA 1527 and 24 percent in WAA 1528) of the existing roads are main access roads (i.e. arterial roads). In addition, these WAA's contain private and state land holdings (including encumbered lands) with roads over which the Forest Service has no jurisdiction. Access for recreation is also of particular concern within these two WAA's, due to their proximity to the community of Whale Pass. Overall, road density within the Project Area would be 0.96 mile per square mile after completion of closures. This access management plan is designed to reduce exposure of wildlife populations to the level of hunting and trapping that results from increased road densities.

Implementation of one of the conservation strategies, proposed under Alternatives 3, 4, and 6 would maintain large blocks of habitat in the unfragmented, unroaded condition, preferred by the wolf and the Sitka black-tailed deer, its primary prey. This is anticipated to be most effective under Alternative 4 and to a lesser extent, Alternative 6, which in addition to maintaining large blocks, propose travel corridors to link the Contiguous Old-growth Areas (COGA's).

For known, active denning sites, implementation of disturbance timing restrictions, from February 1 to July 30, have been suggested for any management activities occurring within one-half mile of the den. Timing restrictions would be lifted after May 15 if the den is determined to be unoccupied (Confer and Hall 1994).

The Project Area currently contains 65,735 acres that are within designated Roadless Areas (see Recreation section for a complete discussion). Depending on the alternative selected, this would be reduced by as much as 3,025 acres. Gray wolf populations are expected to be adversely affected.

Marten

The marten is an old-growth-associated species. Timber harvest proposed under the action alternatives would result in habitat capability values displayed in Table 3-85. The primary impacts would be a reduction in the long-term quality of marten cover due primarily to the loss of old growth and associated stand attributes (e.g., snags, downed woody material).

Marten are easily trapped and can be overharvested, especially when trapping pressure is heavy. An increase in road density, particularly when located through marten travel corridors and foraging areas, would increase human access and the risk of trapping mortality. Impacts would be reduced, but not eliminated, by closing roads to motorized use following timber harvest or by placing restrictions on using vehicles for hunting or trapping. Road density within the Project Area would be reduced after completion of harvest due to proposed road closures (Table 3-86).

Between 1,092 (Alternative 6) and 3,216 (Alternative 2) harvest acres are in high quality marten habitat (Table 3-86). Unit 529-270 (108 acres) would remove approximately 50 acres of high quality winter habitat along the east side of Baker Creek, fragmenting an existing corridor linking Merrifield Bay and the Port Protection area. A long string of units (534.1-204, -211, -212; 534-225, -226, -288) proposed along the east side of Pine Creek would heavily fragment an existing band of high quality habitat which likely serves as a stepping-stone link for marten traveling between the Salmon Bay Lake old-growth block and the Sumner Strait coastline. Under Alternatives 2, 3, and 5, harvest is proposed in large patches of high quality marten habitat within Project-defined COGA's: Calder COGA (up to 6 units), Salmon Bay COGA (up to 10 units), and Port Protection COGA (up to 4 units) and within two Project-defined Corridors: El Cap Corridor (up to 1 unit) and Red Bay Corridor (up to 2 units). Entry into these areas would be minimized and would occur near the edges of the COGA's and corridors under Alternative 6. Under Alternative 4, no units are proposed for harvest within the COGA's and no harvest proposed within corridors is on high quality habitat. The remaining proposed units would reduce the size of the patches scattered throughout the Project Area and larger blocks of high quality marten winter range habitat, by the removal of timber at their perimeters. Distance between patches would also increase, especially in VCU's 536 and 537.1 which are naturally fragmented and have experienced intensive timber harvest in the past.

River Otter

The river otter's primary habitat is in old-growth stands that are near the coast and larger lakes and streams of the Project Area. The otter is an MIS that should benefit from measures taken during unit design, limiting timber harvest in beach fringe and estuary, stream corridors, and riparian habitat. Scheduling development activities away from beach fringe, lake buffers, and Class I and II streams would result in maintenance of 1995 habitat capabilities for river otter (Table 3-85).

Bald Eagle

The potential effect of the Project on bald eagles would be limited to nesting disturbances during logging operations. The extent of this effect would vary depending on the: (1) amount of timber harvest activity occurring in the vicinity of eagle habitat, (2) type of logging operation, (3) amount of screening cover within the vicinity of nest sites, and (4) timing of logging operations relative to eagle nesting.

Scheduling development activities away from beach fringe, lake buffers, and Class I and II streams would effectively reduce impacts to bald eagle habitat capability (Table 3-85). Management activities within 330 feet of an eagle nest site are restricted by an Interagency Agreement between the Forest Service and the U.S. Fish and Wildlife Service (USDA Forest Service and USDI Fish and Wildlife Service 1990). Additionally, timing restrictions have been established for controlled blasting that may occur within one-half mile of an eagle nest site and for helicopter logging and/or flight paths within one-quarter mile of a nest site.

Buffers around eagle nests that are near Units 527-228, 530-241, 539-222, and 540-206 need to be identified during unit layout to ensure maintenance of 330-foot buffer zones. The east half of Unit 529-286 was dropped due to adjacency to an eagle nest and an estuary buffer surrounding Buster Bay.

Between March 1 and August 31, restrictions on controlled blasting would be implemented on all road construction proposed within a half-mile radius of a bald eagle nest site and on all helicopter logging and/or flight paths within one-quarter mile of a nest. These restrictions would be lifted after June 1 if the nest is found to be unoccupied. Up to seven proposed roads, with nine associated units could be affected by bald eagle timing restrictions (Table 3-89).

Table 3-89
Miles of Road Construction Affected by Seasonal Blasting Restrictions for Bald Eagle

Road Number	Affected Miles of Road	Associated Unit(s)
64-75-24	0.5	527-229
64-76-10.3	0.5	529-286
64-76-12	0.65	530-241
66-80-30	0.5	538-210, 540-221
66-80-05	0.5	539-222
66-80-04	1.25*	540-206
66-80-33	2.25*	551-211, 551-263
Total Miles	**6.67**	

Source: Ketchikan Area GIS

* 0.5 mile of affected road is outside of buffer, but dependent on the road construction within the buffer.

Vancouver Canada Goose

The high quality nesting and brood-rearing habitat of Vancouver Canada geese is generally in forested areas near wetlands, lakes, streams, beaches, and estuaries. Implementation of the action alternatives would result in a one percent decrease in habitat capability from current conditions (Alternative 6, Table 3-85). Between 93 (Alternative 6) and 277 acres (Alternative 2) are proposed for harvest within high quality habitat (Table 3-87). Timber harvest and road construction would be avoided, where possible, within 410 feet (125 meters) of goose habitat where geese are present during nesting, brood rearing, and molting (late April through August). This restriction also applies where geese are present during wintering periods (TLMP Draft Revision 1991a).

Red-breasted Sapsucker

The red-breasted sapsucker is a primary cavity-excavator, preferring low-volume, old-growth forest, although this species can effectively use forests exhibiting high volumes. It is estimated that the action alternatives would result in a decrease in habitat capability of 2.2 to 5.7 percent, respectively, over current conditions (Table 3-85).

An analysis of the existing habitat indicates that between 32 and 87 percent of the proposed units are within high quality sapsucker habitat (Table 3-87). The largest contiguous tracts of high quality sapsucker habitat currently exist within the Project-defined COGA's and corridors. Implementation of any of the alternatives, with the exception of Alternative 4 which is designed to stay out of the Project-defined COGA's and corridors, and Alternative 6 which minimizes entry into Project-defined COGA's and corridors, would reduce and fragment this habitat by harvesting up to 26 units (Alternative 2). Additional units of concern include a long string of units (534.1-204, -211, -212; 534-225, -226, -227, -228) proposed along the east side of Pine Creek that would heavily fragment an existing band of high quality habitat that functions as a travel corri-

dor linking the Salmon Bay Lake old-growth block and the Sumner Strait coastline. These seven units fall within watersheds A04A and A36D, both of which exceed the standard and guideline of 275 snags per 100 acres. High quality red-breasted sapsucker habitat on Thorne Island (VCU 551) is naturally fragmented. All conventional units proposed on the island would induce further fragmentation through the partial or total removal of existing high quality old-growth patches. The effects of harvest within units of concern would be partially mitigated by the retention of additional structure through implementation of appropriate Harvest Types. The uneven-aged management plan for Thorne Island, proposed under Alternative 4 and Alternative 6, is expected to minimize the effects of timber harvest on the island by mimicking natural disturbances through two-acre patch cuts.

The remaining proposed units affecting high quality red-breasted sapsucker habitat would reduce patch size and increase fragmentation within the Project Area. Distance between patches would also increase, particularly in VCU's 536 and 537.1 which are naturally fragmented and have experienced intensive harvest activities.

The long-term effects of reduced snag and defective tree habitat on red-breasted sapsuckers are expected to be reduced by maintaining structure in every harvest unit. For units receiving Type A through F harvest treatment, the presence of large snags and defective trees within these second-growth stands may increase sapsucker use. Harvest Type G and H would retain sufficient structure to provide limited habitat throughout the timber rotation, and Type I is anticipated to retain sufficient structure for continued use within these units.

Hairy Woodpecker

The hairy woodpecker is a primary cavity-excavator that prefers high-volume old-growth forest, but can also effectively use lower volume stands. The action alternatives would decrease Project Area habitat capability by 2.5 to 6.0 percent (Table 3-85) from current conditions. Between 858 and 2,512 acres of the proposed harvest units are within high quality hairy woodpecker habitat (Table 3-87). Unit-specific concerns are similar to those discussed for the red-breasted sapsucker. The long-term effects of reduced snag and defective tree habitat on hairy woodpeckers would be reduced by prescribing that structure be maintained in every harvest unit. The effects of retention within the nine proposed harvest types would be similar to those described for red-breasted sapsucker.

Brown Creeper

The brown creeper is highly dependent on large-diameter, old-growth trees (Volume Class 6 and above). Timber harvested under the action alternatives would result in a 1 (Alternative 6) to 4 (Alternative 2) percent decrease, respectively, in habitat capability over current conditions. Depending on the alternative, between 132 (Alternative 6) and 776 (Alternative 2) acres of high quality habitat would be harvested (Table 3-87). The majority of the high quality habitat occurs within the Project-defined COGA's and corridors. Implementation of Alternatives 2, 3, and 5 would reduce and fragment this habitat by harvesting up to 12 units (Alternative 2). In addition, Units 527-227 and -228 (Alternatives 2, 4, and 5), would fragment the patch of high quality habitat (~800 acres) on Protection Head. Unit 527-224 (Alternatives 2, 4, and 5), located in the neck of Protection Head, would restrict movement between Protection Head and the mainland. The remainder of the proposed units affecting brown creeper habitat would reduce the size of patches scattered throughout the Project Area. Distance between patches would increase, particularly in areas that have already received intensive harvest activities. The effects of harvest within units of concern would be partially mitigated by the retention of additional structure through implementation of appropriate harvest types.

Effects on Snag Density By Watershed

Snags and defective live trees provide critical nesting and foraging habitat for cavity excavators. Therefore, the TLMP Draft Revision (1991a) standards and guidelines call for maintenance of a minimum of 275 snags per 100 acres of forested habitat, averaged on a fourth-order watershed basis, to provide for cavity excavating wildlife species. To ensure that this standard and guideline is met, three levels of concern were developed. A concern level was assigned to each

individual harvest unit, based on site-specific review and results of the snag density analysis. During field analysis, wildlife biologists assessed each unit to identify any site-specific retention areas.

Concern Level 1 was assigned for units located in watersheds where snag densities exceeded standards and guidelines and where not adjacent to past harvest units. Concern Level 2 was identified for units located in watersheds that are at or near the minimum snag densities prescribed by the TLMP Draft Revision (1991a) or are adjacent to past harvest units. For units located in watersheds currently below the minimum prescribed snag densities or within a heavily harvested sub-drainage, Concern Level 3 was assigned. The concern level and specific design for each proposed unit within the Project Area are included in the unit card and silvicultural prescription (Planning Record).

Nine general types of silvicultural treatments were developed through the ID Team process. These silvicultural treatments address the levels of concern discussed above by retaining differing levels of structure within each unit. The treatments were developed in coordination with foresters, logging engineers, wildlife biologists, and visual resource specialists. Four of the treatments are for regeneration harvests, and were developed based on the operational guidelines described in the Region 10 Reserve Tree Selection Guidelines (USDA Forest Service 1993c). One overstory removal treatment, three shelterwood/seed tree harvest types, and one uneven-aged harvest treatment also were developed. These treatments are used in place of, or in conjunction with, the general retention levels. The typical design for each level of retention is described in the Lab Bay Timber and Vegetation Resource Report.

For units identified as Concern Level 1, a Type A, or greater, harvest prescription was designated. Units identified as Concern Level 2, were typically assigned as harvest Type B. For Concern Level 3, a Type D, an overstory removal, shelterwood/seedtree harvest, or an uneven-aged harvest was typically prescribed. Type C regeneration harvest was developed for helicopter harvest units, and typically replaces a Type A regeneration harvest.

Figure 3-10 (Silviculture section) displays the designated clearcut harvest types that would be implemented within the proposed harvest units. Regeneration harvest Type A would leave nonmerchantable trees along the edge of the harvest unit, and safe snags throughout the unit. Type B would implement Type A, plus leave additional green trees (up to 100 percent retention within buffer zones) as necessary to meet snag level requirements within a watershed. Type C would leave nonmerchantable trees and safe snags throughout the unit. Type D clearcuts leave islands or strips of merchantable and unmerchantable reserve trees within the unit. Types E through H typically are used in conjunction with Harvest Types A through D. Harvest type E is an overstory removal, Type F is a seed tree prescription, Types G and H are shelterwood harvests. Type I is an uneven-aged harvest prescription that may be implemented in place of, or in conjunction with, harvest Types A through C. Table 3-80 describes the type of harvest and displays the percent of volume that typically would be maintained under each silvicultural treatment and the percent of the acres proposed for harvest under each silvicultural treatment.

Using the silvicultural treatments as prescribed would reduce the effects of clearcutting on wildlife, particularly species such as cavity excavators, that utilize stand attributes characteristic of old-growth forest. By retaining structure within harvest units, diversity levels within regenerating units could be better maintained. Retaining live trees, as well as snags ensures adequate snag recruitment throughout the length of the rotation, provides additional snow interception within regenerating units, and maintains greater structural diversity within the second-growth stands. Leaving nonmerchantable trees and safe snags within the harvest unit is a minimum recommendation identified for all harvest units. Harvest Types A through F would provide snags over the harvest rotation and provide an increased level of structure over traditional regeneration harvests. Types G and H would retain sufficient structure to provide limited habitat for cavity excavators throughout the timber rotation. Harvest Type I is anticipated to retain sufficient structure for continued use of these units by cavity excavators.

Estimated snag densities within old-growth stands range from 4 to 8 snags per acre (snags greater than or equal to 15 inch d.b.h. and greater than or equal to 10 feet in height). Although snags and green trees would be retained within harvest units, snag densities within all watersheds receiving harvest would decline with implementation of any action alternative due to the reduction in live trees needed for future recruitment.

Ten third- and fourth-order watersheds in the Project Area are currently estimated to be below the recommended level of 2.75 snags per acre due to past harvest (Table 3-77). Units would be harvested in four of these watersheds (A21A, A41A, A52A, and A54A) under at least one alternative. The specific harvest units and corresponding acreages for each are listed in Table 3-90. In addition, estimated snag densities for watershed A22A would be brought below 2.75 snags per acre through harvest proposed under this project. A21A, A41A, and A22A are third-order watersheds and therefore, due to their small size, more easily fall below 275 snags per 100 acres when harvest occurs within their boundaries. Watersheds A52A and A54A are located in the Southeast portion of the Project Area, which has received significant past harvest (44 percent and 34 percent of the forested acres, respectively within these watersheds). To maintain the current levels of snag densities after harvest within these watersheds, it would be necessary to retain all existing snags and sufficient green trees to replace each snag throughout the rotation. Units within these watersheds have been designed, to the extent practicable, to retain this additional structure within their boundaries.

Mitigation measures have been designed to increase structural diversity while minimizing timber volume losses within harvest units. Increasing the total area harvested to compensate for structure retention could increase overall fragmentation in the Project Area and further reduce landscape diversity levels. No additional acres would be harvested to compensate for structure retention.

Table 3-90

Harvest Units within Watersheds with Less Than 2.75 Snags per Acre

			Alternatives				
Watershed	Harvest Units	Acres	2	3	4	5	6
A21A	529-270	4	X	X			
A41A	539-206	11	X	X	X	X	X
A52A	538-223	32	X		X		
A54A	538-208	12	X	X	X		
A22A	527-206	37	X			X	
	529-270	61	X	X			

Source: Ketchikan Area GIS

Biodiversity

Although the No Action Alternative does not propose timber harvest, the biodiversity of the landscape would continue to be affected by natural processes and ongoing human activities. For example, successional habitats would continue to change as windthrow or the natural felling of dead and dying trees create openings in the canopy, permitting new forested stands to become established. Over the long term, climax tree species would emerge in old-growth forests and then be replaced by early-successional species representative of a particular age class. Landslides, periodic flooding of streams, and infrequent fires would allow pioneer vegetative species to take over large areas for long periods of time. Additionally, human access would continue to affect wildlife populations through increased hunting and trapping pressure.

All action alternatives propose management activities consistent with TLMP (1979, as amended). The action alternatives are also consistent with the LUD system designated under the TLMP Draft Revision (1991a), with the exception of Alternatives 4 and 6, which propose harvest of 36 acres of Beach Fringe under the Thorne Island uneven-aged management plan. Based on the proposed no-harvest areas defined under the TLMP Draft Revision (1991a), all action alternatives would retain and connect habitats via existing undisturbed areas, beach fringe and estuary fringe, stream corridors, muskegs, very steep slopes, and other areas considered unsuitable for timber harvest. Managed stands would change from multistoried old-growth forest to even-aged stands in the early-successional stage. The subsequent crops of younger trees would yield more usable wood fiber per acre; however, the conversion of old growth to younger stands may cause some changes in the value of certain forest products, changed value of wildlife habitat, reduced diversity of ecosystem function and composition, and changes in aesthetic qualities.

Many species of wildlife depend on a forest ecosystem with both vertical and horizontal structure. The Sitka black-tailed deer depends on horizontal diversity in a stand for hiding cover and an adjacent herbaceous shrub community for forage. The Prince of Wales flying squirrel depends on vertical diversity for its forage at the forest floor and nesting cavities in the canopy. Vertical and horizontal structural diversity, typically found in old-growth forests, would be affected under the proposed action alternatives as timber harvest converts up to 3,909 acres of multistoried forest to managed even-aged stands, increasing the homogeneity of the Lab Bay Project Area.

The spatial configuration of wildlife habitats within the Project Area would be affected to varying degrees by each action alternative. These spatial changes likely would increase the edge effect at the old-growth patch perimeters; however, as the number of old-growth patches decreases, edges associated with this habitat would be reduced. At the same time, interior habitat considered important for many wildlife species would be reduced. These changes are summarized earlier in this section (Figure 3-15).

The number and sizes of corridors linking large areas of contiguous old growth would decline under the action alternatives. It is considered important that old-growth patches remain connected to other stands of old growth via corridors of a similar community type. Without these corridors, populations may become isolated, migration and dispersion may be impeded, and genetic pools may become segregated (Pace 1991). The re-establishment of previously harvested beach fringe, estuary fringe, and riparian areas to mature forest would ensure future linkages in many areas where these types of corridors do not currently exist.

Conservation Strategies

The conservation strategies described in the Affected Environment section represent different approaches to maintaining old-growth habitat, each with a different level of risk to wildlife populations. For the Lab Bay Project, one or more different strategies were incorporated into each action alternative. All alternatives propose management consistent with the TLMP (1979, as amended) and the TLMP Draft Revision (1991a).

Alternatives 2 and 5 rely solely on the TLMP Draft Revision (1991a) LUD strategy for management of old-growth habitat. No-harvest LUD's, including LUD II, Special Interest Areas, TTRA and no commercial harvest stream buffers, and beach fringe and estuary are reserved from harvest. The areas protected under this strategy are described under Conservation Strategies heading, Affected Environment. Under this alternative, the large old-growth blocks associated with the Mt. Calder and Salmon Bay LUD II's are protected.

Alternative 3 incorporates the Draft Interim Management Guidelines HCA strategy (USDA Forest Service 1994b) for protection of old growth. The proposed Salmon Bay and the Buster Creek HCA's would be protected (see Figure 3-14). Because the Salmon Bay HCA is located within the Salmon Bay LUD II, it does not protect any additional old-growth compared to the TLMP Draft Revision (1991a) LUD strategy. The Buster Creek HCA protects approximately 3,700 acres of old growth. Additional protection of old-growth habitat under Alternative 3 is provided by the avoidance of harvest on high vulnerability karst areas.

Alternatives 4 and 6 incorporate the Project-defined Contiguous Old Growth Management Area (COGA) strategy. Four contiguous old growth areas are defined for the Project: two medium-sized and two small COGA's (see Figure 3-14). In addition, five travel corridors are proposed where harvest would occur on an extended rotation of 195 years. The eight existing old growth blocks in the Project Area are largely incorporated into the COGA's and corridors. Under both alternatives, the small COGA's located in the Baker Creek/Port Protection area and on Thorne Island would be deferred from harvest. Alternative 4 avoids harvest within either of the two medium-sized COGA's, while Alternative 6 allows a small amount of harvest on the perimeters. Harvest in the corridors is on an extended rotation, and for this entry is located at the perimeter of the corridors. Alternative 6 also avoids harvest within the Draft Interim designated HCA's (USDA Forest Service 1994b).

Each of the action alternatives would protect a minimum of approximately 25,000 acres of old growth through implementation of the TLMP Draft Revision (1991a) LUD's (see Table 3-71). Thus, each alternative will provide sufficient acreage in the old-growth condition to meet the requirements for the Old Growth prescription specified in the TLMP (1979, as amended). Each of the action alternatives will allow the Project Area to contribute to the maintenance of old-growth habitat to support viable populations as measured on the Ecological Province level.

Cumulative Effects

Cumulative effects are the result of changes in the environment caused by the interaction of natural ecosystem processes combined with the effects of multiple management actions. The assessment of cumulative effects in the Lab Bay Project Area and adjacent lands is based on past timber harvest and associated activities, proposed actions (e.g., the Lab Bay entry), and foreseeable actions through the year 2054 (the end of the first 100-year harvest rotation). In addition, the cumulative effects analysis includes the year 2004, which marks the end of the KPC Long-term Contract and the halfway point in the current 100-year harvest rotation.

The cumulative effects analysis for wildlife species is based on implementation of the TLMP 1979, as amended and the TLMP Draft Revision (1991a). To more fully assess the effects of harvest on old growth through 2054, a comparative analysis was conducted for the five identified conservation strategies. This discussion also provides a qualitative assessment of the effects to wildlife under each strategy. The analysis shows how each of the conservation strategies will protect old-growth habitat to meet or exceed the Old Growth prescription requirement of TLMP (1979, as amended). The 1996 TLMP Draft Revision addresses the issues of biodiversity and viable populations on the Forest-wide level, and evaluates several conservation strategies. Once a Forest Plan Revision is adopted, it will include guidelines for implementation of a conservation strategy.

Future timber harvest and clearing also would occur on state, private, and encumbered lands, which total 14,153 acres within Project Area boundaries. A large percentage of these private lands are currently state-selected for recreation or homesteading, with a smaller percentage managed for mining products. While it is not known how much or when old-growth would be removed in the future, it is assumed given the current uses of private land, that a large proportion of the old-growth acreage would remain by year 2054. Some future recreation development may occur within areas such as Hole-in-the-Wall and Exchange Cove. In addition, small clearings are expected to be created in areas set aside for homesteading and in the Port Protection and Point Baker communities. Over the long term, declines in habitat capabilities on non-Forest System lands are assumed to be less than those occurring on National Forest System land on an acre-for-acre basis.

Under both the Lab Bay and adjacent CPOW Projects, varying amounts of dead and downed woody material, snags, and green-tree replacements would be retained within each proposed harvest unit. The objective is to maintain some of the old-growth characteristics normally lost through timber harvest. Since the retention of structure is expected to continue with future harvest entries, the cumulative effects of timber harvest on old-growth dependent wildlife spe-

cies would be partially mitigated. The Silviculture section describes and illustrates this management approach in detail.

The anticipated continuation of road construction within the Lab Bay Project and adjacent CPOW areas likely would increase subsistence and nonsubsistence hunting in these areas. This effect can be mitigated by adhering to the current management practice of closing dead-end local roads or roads accessing important wildlife habitat upon completion of harvest entries. It also would be mitigated by continuing to implement a road access management plan for the Project Areas.

Management Indicator Species

Habitat capability for the majority of the Management Indicator Species would not decline significantly between 1995 and 2004; however, most would decline dramatically by the year 2054. This illustrates that the long-term effect on wildlife populations from land management activities may not be evident for several decades. Two species that would decline significantly by 2004 over 1954 habitat capability levels are the brown creeper and hairy woodpecker.

Table 3-91

Cumulative Effects to Estimated MIS Habitat Capability (% of 1954 HC)

Species	Percent of 1954 1995	2004	2054
Black-tailed Deer[1]	84%	83%	45%
Black Bear	95%	94%	59%
Gray Wolf[2]	94%	92%	50%
Marten[1]	84%	81%	44%
River Otter	82%	82%	81%
Bald Eagle	79%	79%	78%
Vancouver Canada Goose	78%	76%	62%
Red-breasted Sapsucker[1]	85%	80%	36%
Hairy Woodpecker[1]	52%	49%	19%
Brown Creeper[1]	40%	38%	16%

Source: Planning Record

[1] Values are adjusted for patch size effectiveness.

[2] Wolf values are based on deer values adjusted for patch size effectiveness.

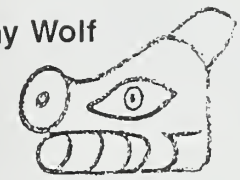
Black-tailed Deer

From the year 1954 to 2004, black-tailed deer habitat capability is projected to decrease by 17 percent (Table 3-91). By 2054, habitat capability is projected to decline by 55 percent compared to 1954. The primary contributor to this decline would be the loss of quality forage and cover found in old growth and fragmentation of old-growth habitat.

Black Bear

From 1954 to 2004, bear habitat capability is projected to decrease by 6 percent. By 2054, black bear habitat capability is projected to decline by 41 percent in the Project Area (Table 3-91). The primary contributor to this decline would be the loss of forage as the canopy closes in the harvested areas. The model does not account for size and spacing of habitat; therefore, the reduction of cover habitat due to timber harvest is not reflected in the habitat capability values.

Gray Wolf



From 1954 to 2004, gray wolf habitat capability is projected to decline by 8 percent in the Project Area (Table 3-91). By 2054, the habitat capability is projected to decline by 46 percent when compared to 1954. The primary contributor to this decline would be the loss of available prey in old growth forests. The model does not account for trapping pressure, which is expected to further reduce projected habitat capability.

Marten

From the year 1954 to 2004, marten habitat capability is projected to decline by 19 percent (Table 3-91). In 2054, the Project Area habitat capability is projected to decline by 52 percent compared to 1954. The primary cause of this effect would be the direct loss and fragmentation of old-growth habitat, which provides optimum den sites and prey items. The model does not account for road densities, which, as they increase, may increase trapping pressure.

River Otter

From the year 1954 to 1995, river otter habitat capability is projected to have declined by 18 percent (Table 3-91). The primary contributor to the declining habitat capability would be the direct loss of canopy cover, large diameter trees and snags, and den sites, habitat parameters preferred by the river otter. Retention of Beach Fringe and Estuary buffers and stream buffers protects river otter habitat, thereby stabilizing the habitat capability at 1995 levels. Over time, habitat capability may improve as previously harvested habitat regenerates within these retention areas.

Bald Eagle

As Table 3-91 indicates, from 1954 to 1995, the bald eagle habitat capability is projected to have declined by 21 percent. The primary contributor to this decline would be the direct loss of nests in old-growth trees, particularly those near foraging sites. Through retention of Beach Fringe and Estuary buffers and stream buffers, most bald eagle habitat would be protected and only slight reductions would occur between 1995 and 2054. Over time, habitat capability may improve as previously harvested habitat regenerates within these retention areas.

Vancouver Canada Goose

From 1954 to 2004, the Vancouver Canada Goose habitat capability is projected to decline by 24 percent (Table 3-91). By 2054, the habitat capability is expected to decline by 38 percent when compared to 1954 levels. The primary factor in this decline would be the direct loss of old-growth habitat surrounding uncontained stream channels.

Red-breasted Sapsucker

From 1954 to 2004, red-breasted sapsucker habitat capability is projected to decrease by 20 percent in the Project Area (Table 3-91). By 2054, the habitat capability is projected to decline by 64 percent when compared to 1954. The declining habitat capability would be linked directly to the loss and fragmentation of large, low density old-growth stands that provide foraging and nesting sites.

Hairy Woodpecker

From the year 1954 to 2004, the hairy woodpecker habitat capability is projected to decline by 51 percent (Table 3-91). By 2054, the habitat capability is projected to decline by 81 percent when compared to 1954. The rapid and sustained decline in habitat capability is linked directly to the loss of uneven-aged timber stands with many snags which provide critical foraging habitat for the hairy woodpecker, and due to the fragmentation of old-growth habitat.

Brown Creeper

Table 3-91 indicates that between 1954 and 2004, the brown creeper habitat capability is projected to decrease by 62 percent in the Project Area. By 2054, the habitat capability is projected to decline by 84 percent compared to 1954. The primary contributor to the declining habitat capability is the loss of large, old-growth trees and snags, which provide both foraging and nesting sites, and due to the fragmentation of old-growth habitat.

Biodiversity and Conservation Strategies

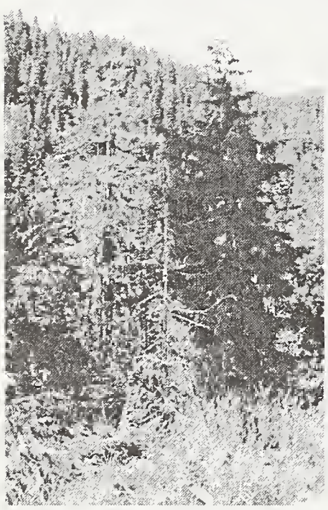
The long-term effects to old-growth habitat under the TLMP (1979, as amended) and the TLMP Draft Revision (1991a) LUD system were evaluated to the year 2054. In addition, other conservation biology strategies incorporating the TLMP Draft Revision (1991a) LUD system were evaluated, including the Draft Interim HCA and Project-defined COGA strategies. Finally, the areas recommended for protection under the Draft Karst standards and guidelines were evaluated to determine their potential for contributing to wildlife population viability. Under all strategies, old-growth habitat within the Congressionally-designated Mt. Calder/Mt. Holbrook and Salmon Bay LUD II areas, as well as TTRA stream buffers, are assumed to be retained through year 2054. Table 3-92 displays the acres of old growth, number of large old-growth blocks, and connectivity expected to remain in 2054 under each strategy.

Under all of the conservation strategies, managed stands would change from multistoried old-growth forest to even-aged stands in the early-successional stage. While subsequent crops of younger trees would yield more usable wood fiber per acre, the conversion of old growth to younger stands would cause changes in the value of wildlife habitat, reduced diversity of ecosystem function and composition, and changes in aesthetic qualities.

The spatial configuration of wildlife habitats within the Project Area would be affected to varying degrees under each strategy. These spatial changes resulting from timber harvest likely would increase the edge effect at the old-growth patch perimeters as overall patch size decreases. As old-growth patches are eliminated interior habitat considered important for many wildlife species would be reduced to varying degrees depending on the conservation strategy adopted.

TLMP (1979, as amended)

The old-growth retention areas, congressionally-mandated LUD II's (Mt. Calder/Mt. Holbrook and Salmon Bay), and TTRA stream buffers are assumed to be retained through 2054 under TLMP. It has been assumed that the extended rotation areas would be harvested by 2054. Under this scenario, approximately 31,110 acres of old growth would remain by the year 2054. The retention areas would provide scattered patches of old growth across the Project Area. No travel corridors would link these small set-aside areas to the LUD II areas, since the TTRA buffers run north-south and would not provide the east-west linkages between remaining patches. Natural and induced fragmentation would leave insufficient old growth over the central portion of the Project Area. It is expected that wildlife habitat capability would decline to values below those displayed for the TLMP Draft Revision (1991a) LUD system (Table 3-92). Large blocks of old-growth habitat (1,001-10,000 acres in size) would be maintained within the Mt. Calder/Mt. Holbrook and the Salmon Bay LUD II's. Connectivity between these blocks would not be maintained and may cause populations to become isolated, impeding migration and dispersion of species. Figure 3-17 illustrates the size and spacing of old growth by 2054 with the implementation of TLMP (1979, as amended).



TLMP Draft Revision (1991a) LUD System

Under the TLMP Draft Revision (1991a) LUD system, approximately 31,484 acres of old growth would remain. By 2054, old-growth corridors between the LUD II areas would be lost, since the north-south configuration of buffered riparian areas would not provide the necessary east-west linkages between remnant patches. This effect would be especially evident in the expanse of land between the Perue Special Interest Area and the Salmon Bay LUD II area. Natural and induced fragmentation, combined with the absence of a no-harvest LUD, would leave insufficient old growth over this large area. As discussed for the Management Indicator Species, implementation of the LUD system would result in reductions in habitat capability of up to 84 percent (brown creeper) due to direct loss of habitat and the indirect effects of fragmentation. In addition, connectivity would not be maintained between the two remaining large blocks of old-growth habitat (Mt. Calder/Mt. Holbrook and Salmon Bay LUD II's). This lack of travel corridors could cause populations to become isolated, impeding migration and dispersion of species. Figure 3-18 shows the size and spacing of old growth that would remain in the Lab Bay Project Area with the implementation of the TLMP Draft Revision (1991a) LUD system.

Draft Interim HCA Strategy

Under the Draft Interim HCA strategy, approximately 34,257 acres of old growth would remain by year 2054. In addition to retention of the no-harvest LUD's (TLMP Draft Revision (1991a), which includes the Salmon Bay LUD II HCA block, old growth would be retained within the Interim-designated HCA at Buster Creek. However, of the 8,784 acres within the Buster Creek HCA, only 43 percent is currently old-growth habitat. The 1,800 acres of previously harvested stands in this HCA are not expected to exhibit most old-growth characteristics for at least 200 years. The remaining 3,300 acres consist of nonforested and nonproductive forest lands. Therefore, the Buster Creek HCA is not expected to provide the of high-quality old-growth habitat such as currently exists within the two LUD II areas. Finally, implementation of the Interim-designated HCA strategy, in conjunction with the LUD system, would result in the loss of old-growth linkages between the three remaining large blocks due to the absence of east-west riparian buffers.

These three large blocks of old-growth habitat (1,001-10,000 acres in size) are the Mt. Calder/ Mt. Holbrook LUD II, the Salmon Bay LUD II HCA, and the Buster Creek HCA. Connectivity between these blocks would not be maintained and could cause populations to become isolated, impeding migration and dispersion of species. Additionally, human access would continue to affect wildlife populations, particularly wolf and marten, through increased hunting and trapping pressure. It is expected that wildlife habitat capability would be maintained at a slightly higher level than identified for the TLMP Draft Revision (1991a) LUD system alone (Table 3-92). Figure 3-19 illustrates the result of implementing the Draft Interim HCA strategy by year 2054.

Project-defined COGA Strategy

Approximately 44,851 acres of old-growth habitat would remain by year 2054 under the Project-defined COGA strategy implemented in conjunction with the TLMP Draft Revision (1991a) LUD system. Two medium COGA's (Salmon Bay and Mt. Calder), which incorporate and supplement the Project Area LUD II's, and two small COGA's (Thorne Island and Port Protection) would maintain the largest blocks of old-growth habitat (Figure 3-20). Three travel corridors, managed on a 195-year harvest rotation, would link these COGA's to each other and to the shorelines, achieving an east-west connectivity. By year 2054, two additional travel corridors, designated in the southeastern portion of the Lab Bay Project Area, would still consist primarily of second-growth forest. However, these corridors are expected to provide a future travel link between the Lab Bay and CPOW Project Areas.

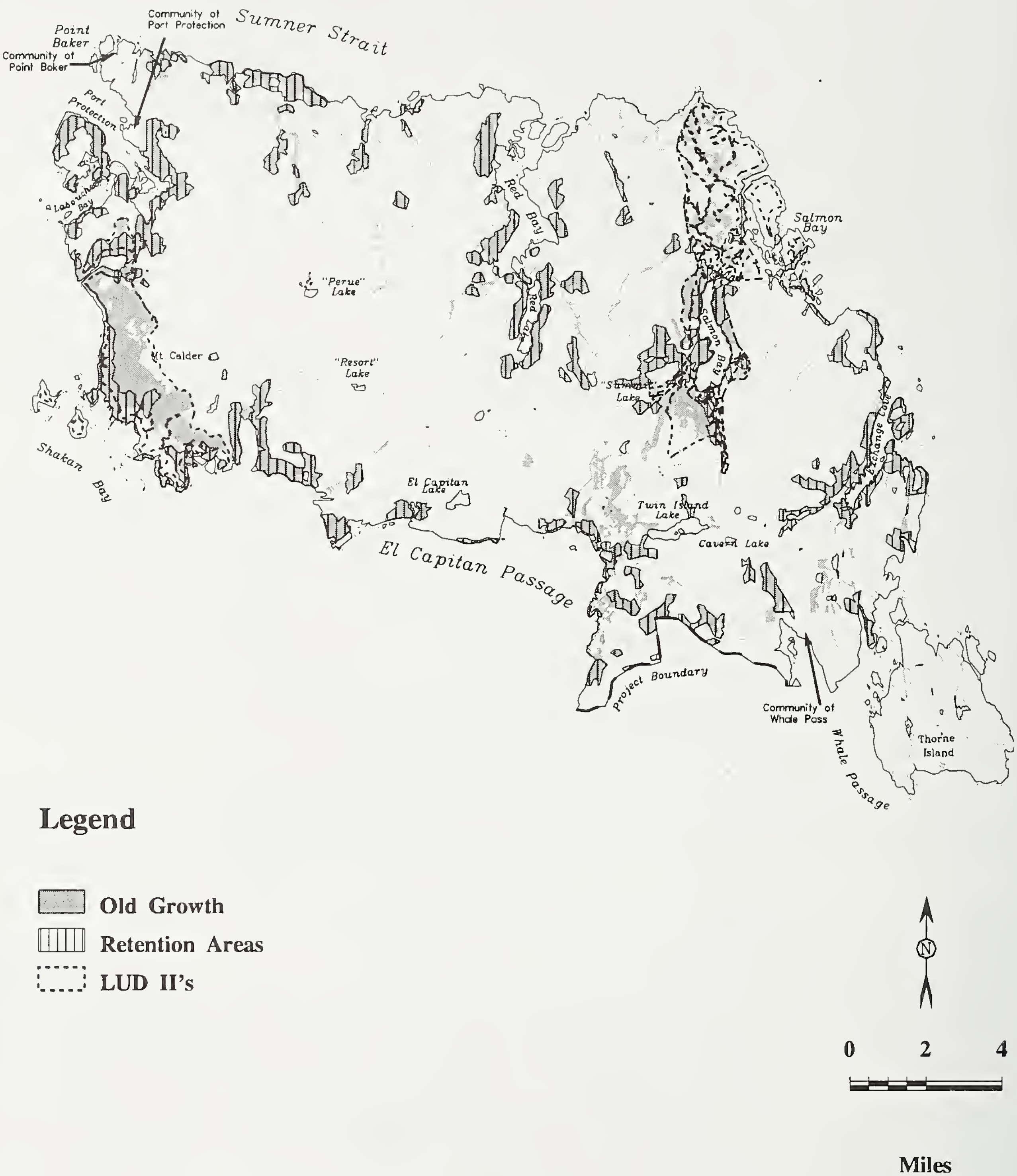
This strategy would maintain three large blocks of habitat, two of which are greater than 10,000 acres in size. Maintenance of these large blocks would retain contiguous old-growth habitat in a relatively unroaded condition, as is preferred by wolves and old-growth dependent species. Loss of species through hunting and trapping is anticipated to be less within these areas than those where roading and harvest have occurred. While it is expected that wildlife habitat capability would decline over current conditions, habitat capability would be much higher than that maintained by the TLMP Draft Revision (1991a) LUD system (Table 3-92).

Draft Karst Standards and Guidelines

The draft interim guidelines for managing the karst resources on Prince of Wales Island propose retention of high vulnerability karst areas (see Geology section for a detailed discussion). Implementation of the interim karst guidelines would occur in conjunction with retention of no-harvest LUD's as designated in the TLMP Draft Revision (1991a). Although the intent of the karst guidelines is to maintain and protect karst features of high value, retention of large karsted areas also could contribute to population viability by maintaining old-growth habitat distributed in large blocks across the Project Area. Approximately 48,749 acres of old growth would remain by 2054 under this strategy.

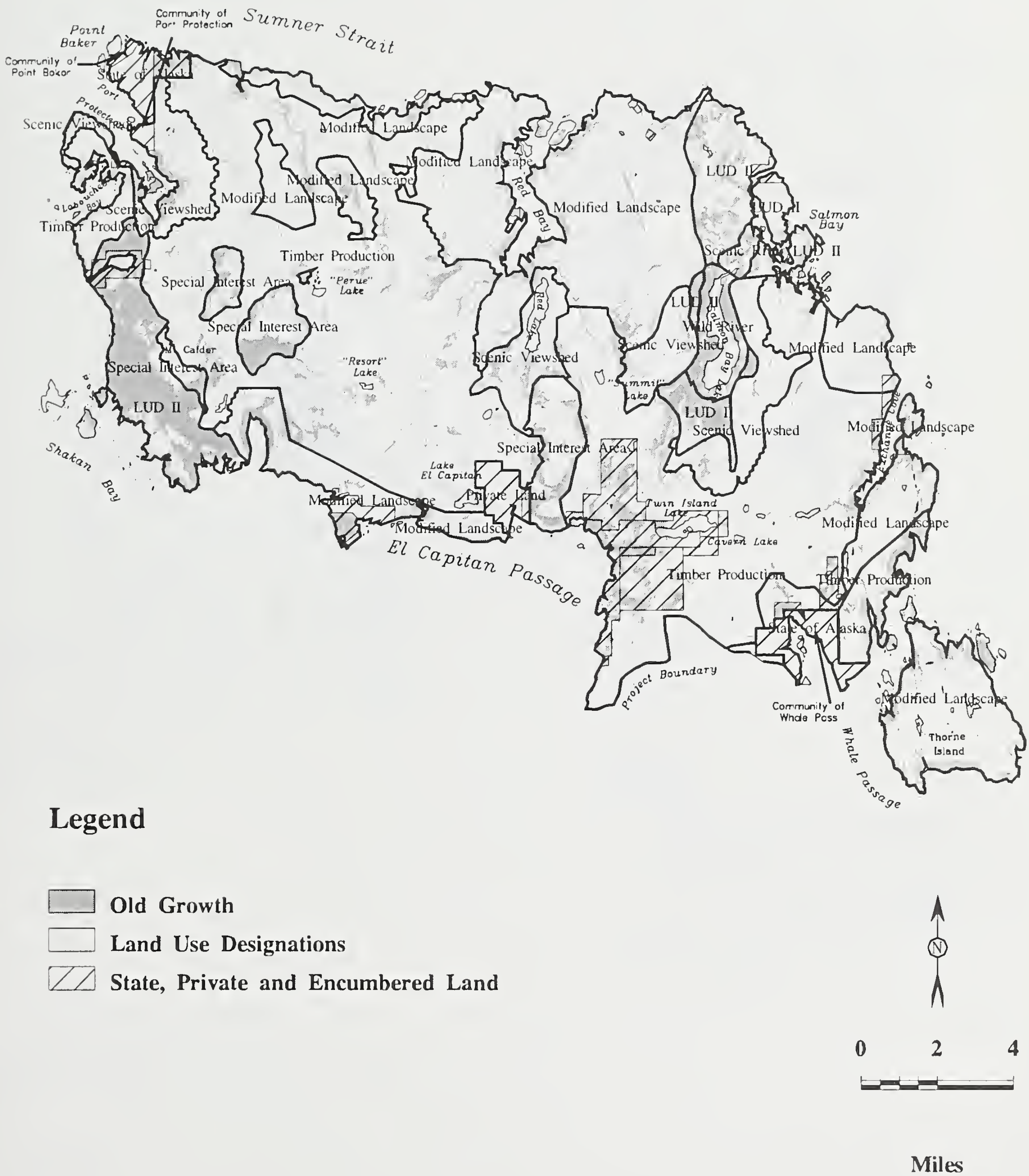
Under the draft interim karst standards and guidelines, four large blocks of habitat would be maintained, two of which are greater than 10,000 acres in size. Portions of all of these blocks have been entered for harvest, extensively in some areas. Over the short-term, they would not

Figure 3-17
Old Growth Remaining under TLMP (1979, as Amended) by 2054



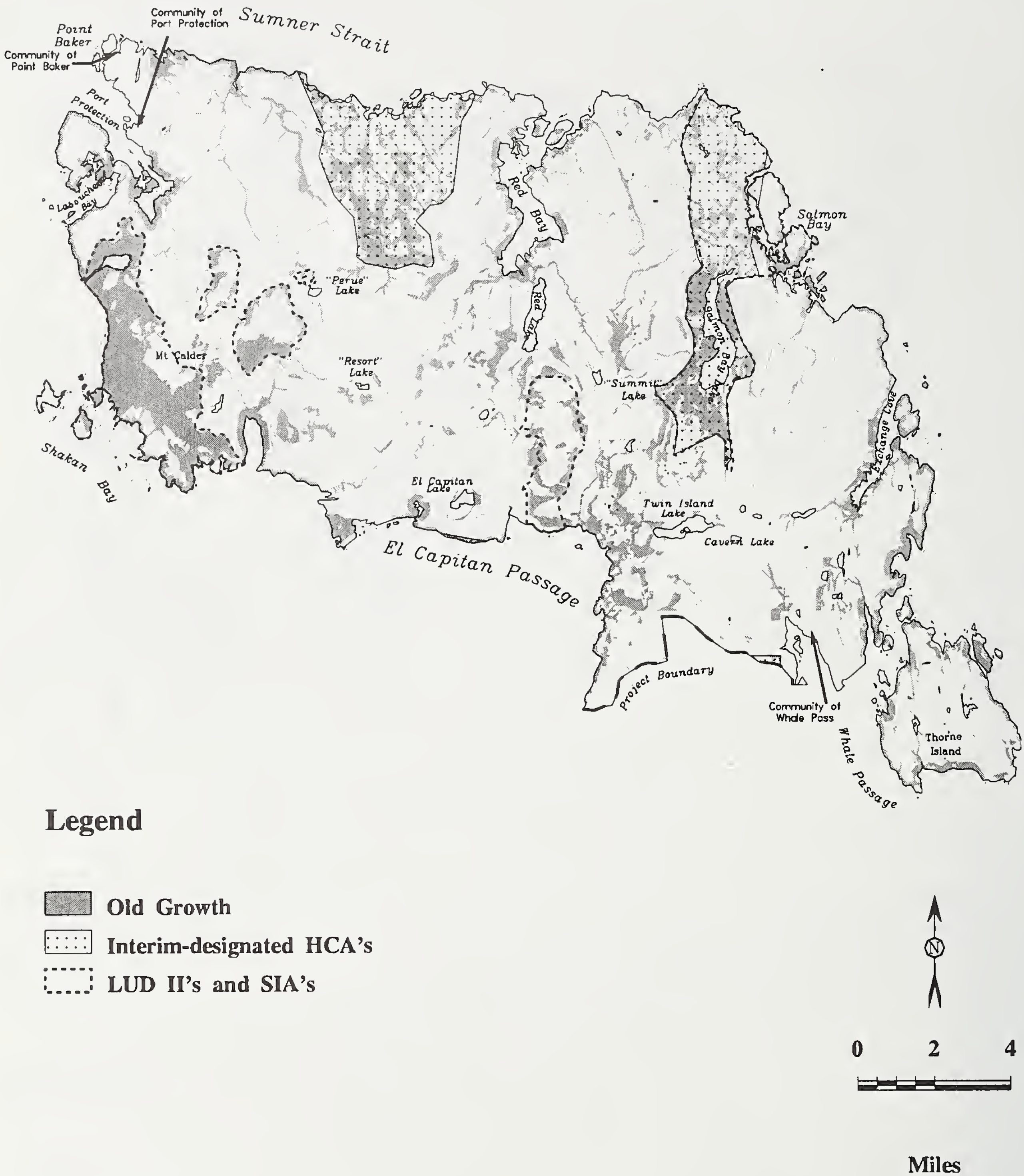
Source: Ketchikan Area GIS

Figure 3-18
Old Growth Remaining under the LUD System by 2054



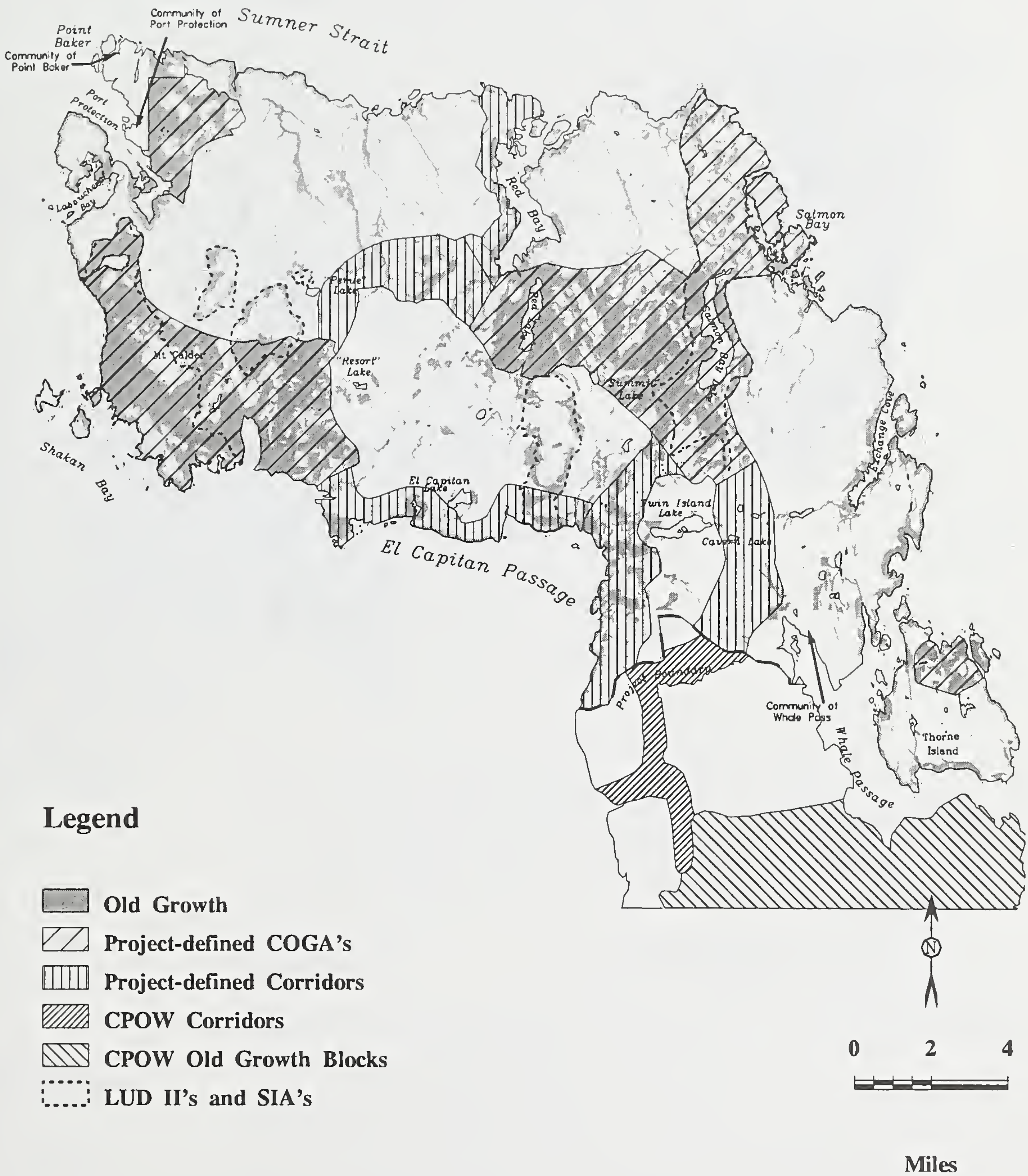
Source: Ketchikan Area GIS

Figure 3-19
Old Growth Remaining under the Draft Interim HCA Strategy by 2054



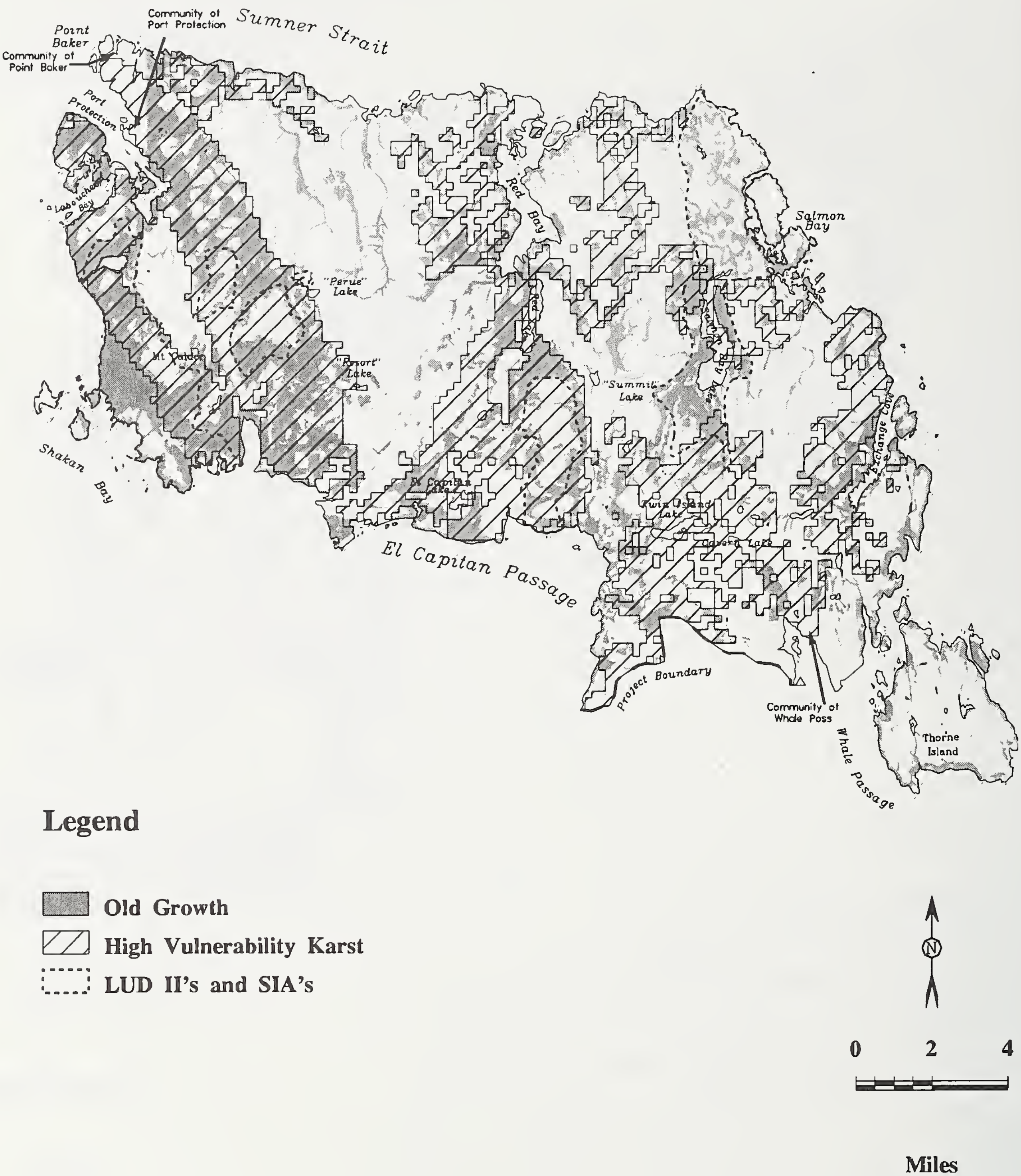
Source: Ketchikan Area GIS

Figure 3-20
Old Growth Remaining under the Project-Defined COGA/Corridor Strategy by 2054



Source: Ketchikan Area GIS

Figure 3-21
Old Growth Remaining under the Draft Karst Standards and Guidelines by 2054



Source: Ketchikan Area GIS

provide the contiguous habitat preferred by old-growth dependent species. Over the long-term, the majority of these areas would return to an old-growth condition, providing extensive areas of contiguous habitat. Connectivity would be maintained in the eastern portion of the Project Area; however, connection with the large block of habitat along the western shoreline would be limited to one connection along the south shoreline. Although this corridor would consist primarily of second-growth forest, it would provide a future travel link with the remainder of the Project Area. It is expected that wildlife habitat capability would decline over current conditions; however, this decline would be less than that displayed for the TLMP Draft Revision (1991a) LUD system (Table 3-92). Figure 3-21 displays the distribution of old-growth habitat that would remain by year 2054 with the implementation of the draft karst guidelines in combination with the LUD system.

Table 3-92
Comparison of Old Growth Remaining Under Conservation Strategies, Year 2054

	Total Acres of Old Growth	Acres of Suitable[3] Old Growth	Acres of[4] Potential Old Growth	No. of Large Blocks 1,001-10,000 Acres	>10,000 Acres	Maintains East - West Connectivity
TLMP (1979 as amended)[1]	31,110	--	1,867	2	0	N
TLMP Draft Revision LUD System (1991a)[2]	31,484	--	4,682	2	0	N
Draft Interim HCA Strategy[2]	34,257	2,829	6,206	3	0	N
Project-defined COGA Strategy[2]	44,851	13,368	7,710	1	2	Y
Draft Karst Strategy[2]	48,749	20,533	20,993	2	2	Y (marginal)

Source: Ketchikan Area GIS

1 Includes retention of LUD II's and TTRA stream buffers.

2 Includes retention of LUD II's, Special Interest Areas, Beach Fringe and Estuary, and no harvest stream buffers.

3 TLMP Draft Revision 1991a.

4 Previously harvested acreage.

Each of the strategies evaluated will protect old-growth habitat acreage that will meet or exceed the Old Growth prescription requirements of TLMP (1979, as amended). Long-term Forest-wide Management of old-growth habitat is addressed in the 1996 TLMP Draft Revision. Under the Preferred Alternative of the 1996 TLMP Draft Revision, a strategy would be adopted that incorporates the major elements of the Project-defined COGA and Draft Karst Standards and Guidelines strategies described above.

Mitigation

Wildlife mitigation measures were developed for the Project Area based on: (1) application of forest-wide standards and guidelines; (2) results of studies on wildlife enhancement projects currently underway on Prince of Wales Island (DellaSala et al. 1993); and (3) results of field visits by Project team biologists. The Project team was able to locate specific areas where mitigation measures would be most effective; these areas should be emphasized during sale layout. The following measures were designed to eliminate or affect timing of harvest in valuable habitats (Landscape Level Mitigation); to increase structural diversity for wildlife within harvest units (Stand Level Mitigation); and to protect wildlife from direct and indirect effects of road construction, harvest operations or human access (Protection Measures). Site-specific mitigation measures are identified by harvest unit (Appendix C) and on the unit cards (Planning Record).

Landscape Level Mitigation

Forest management goals for wildlife direct that as much contiguous old-growth habitat be maintained as possible to ensure the maintenance of viable populations. Additionally, adverse impacts from human activities should be minimized through road and facility management. Under the guidelines of this directive, specific geographic areas were deferred from timber harvest under some alternatives. These areas were selected for various combinations of reasons, all of which provide benefits to MIS and the complex of old-growth obligate and associate species they represent. Geographic areas considered for wildlife protection are presented below.

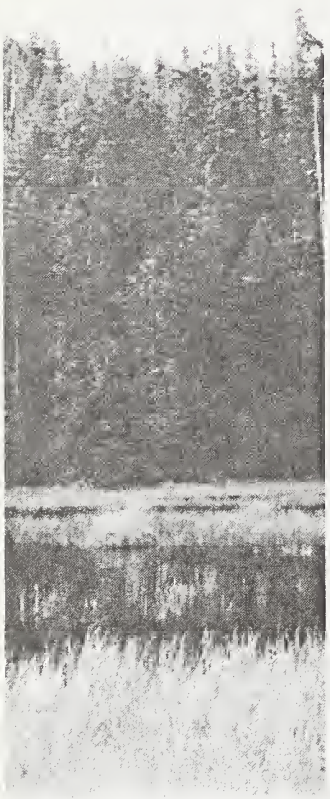
Old-Growth Corridors

Under the Project-defined COGA/Corridor Strategy (Alternatives 4 and 6), five travel corridors are proposed for management over a 195-year harvest rotation. Identification of travel corridors, in conjunction with four Project-defined COGA's, was considered critical in maintaining an old-growth habitat link between the largest tracts of contiguous old growth and the shorelines. The maintenance of two travel corridors located in the area surrounding Twin Island Lake are intended to provide a future old-growth link to the adjacent CPOW Project Area. These areas would be entered for harvest, to varying degrees, under Alternatives 2, 3 and 5.

Thorne Island

Under Alternatives 4 and 6, old-growth habitat would be harvested from Thorne Island using an uneven-aged management plan. Harvest settings would be two acres in size, harvested on a 15-year entry schedule, over a 150-year rotation. A detailed discussion of the plan is found in the Forest Successional Habitats discussion of this section. The proposed two-acre openings would mimic naturally-occurring openings in the forest, maintaining the functions and values of old-growth habitat on Thorne Island. Thorne Island would be entered using conventional harvest methods under Alternatives 2, 3 and 5.

The northern portion of Thorne Island was identified as a high wildlife use area during the field surveys conducted in 1992. This area is within VCU 551 and includes Units 551-201, -205, -213, -214, -216, and -220. It is proposed as a small Project-defined COGA under Alternative 4. This area would be entered under Alternatives 2, 3 and 5.



Red Lake

This area offers a large and relatively unfragmented block of contiguous old-growth habitat with high-volume, low elevation forests surrounding Red Lake. It is located in VCU 533 and includes Units 533-246, -247, -250, -251, -254, -255, -256, -257, -258 and -259. This area makes up the mid-portion of a medium Project-defined COGA under Alternative 4. It would be entered for harvest under Alternatives 2, 3, 5, and 6. Alternatives 2 and 5 would harvest all ten units; Alternatives 3 and 6 would harvest 8 and 4 units, respectively.

Buster Creek

This area is located in the northern portion of the Project Area within VCU 530, and includes Units 530-200, -203, -226, -228, -230, and -240. It is proposed as a medium Interim-designated HCA under Alternatives 3 and 6. This area would be entered for harvest, to varying degrees, under Alternatives 2, 4 and 5.

Port Protection

This area is located within the northwestern corner of the Project Area and represents one of the eight identified blocks of contiguous old-growth habitat within the Project Area. It connects to the east with another large tract of old-growth forest extending from the community of Point Baker. The Port Protection block is located within VCU's 527 and 529 and includes Units 527-206, 527-226, and 529-270. This area is proposed as a small Project-defined COGA under Alternatives 4 and 6. It would be entered for harvest under Alternatives 2, 3 and 5. Alternatives 2 and 5 would harvest all three units. Alternative 3 would harvest Unit 529-270.

Calder Bay

This area, located within the southern portion of the Project Area, is identified as one of the eight contiguous blocks of old-growth habitat. It provides important deer wintering habitat in its lowest elevations along Calder Bay. This block is within VCU 531.1 and includes Units 531.1 -208, -213 and -257. It forms the eastern portion of a medium Project-defined COGA proposed under Alternatives 4 and 6. This area would be entered for harvest under Alternatives 2 and 5.

Stand Level Mitigation

Stand diversity levels within harvest units could be enhanced through the application of specific silvicultural measures designed to provide structural diversity within regenerating stands. Measures include clearcutting with reserve trees (using one of the four types of clearcuts defined in Silviculture section) or partial cutting. The primary objective of this mitigation strategy would be to provide habitat for species that use specific stand attributes characteristic of old-growth forests (e.g., large-diameter snags and structural diversity).

By including old-growth "islands" or reserve trees within harvest units and by partial cutting, within-stand diversity could be better maintained within regenerating units. Old-growth islands should reserve large-diameter snags and live trees. Where possible, the size and density of reserve trees should be dictated by standards and guidelines for cavity-nesting species. For instance, to maintain 50 percent of the maximum populations of hairy woodpeckers in an area, approximately 336 soft and hard snags that are greater than or equal to 15 inches dbh and greater than or equal to 10 feet in height would need to be maintained per 100 acres. Snags could be distributed in clumps away from guylines and in protected draws to minimize blowdown effects and conflicts with safety standards (USDA Forest Service 1993). Retaining live trees, as well as snags, ensures adequate snag recruitment throughout the length of the rotation, provides additional snow interception within regenerating units, provides greater structural diversity within the second-growth stand, and provides refugia for important understory species which can recolonize the second-growth stand when it is old enough. To ensure that nesting habitat, structural diversity, and plant refugia are well-distributed in the second-growth stand, no location in a harvest unit should be more than 400 feet from old-growth trees, wherever possible. Leaving nonmerchantable trees and safe snags along the edges or throughout the harvest unit is a minimum recommendation identified for all harvest units as a means of maintaining snag densities and increasing structure in second-growth stands.

Mitigation Measures W1 through W3 (described in Appendix C) incorporate these strategies in all harvest units. Mitigation Measure W1 corresponds to an identified snag density Concern Level 1 (i.e. snag densities exceed TLMP Draft Revision (1991a) proposed standards and guidelines) and may be met with any of the harvest types. Mitigation measure W2 corresponds to Concern Level 2 (i.e. snag densities approaching a minimum 275 snags per 100 acres) is typically met with Harvest Type B though I. Mitigation Measure W3 corresponds to Concern Level 3 (i.e. watershed is currently below 275 snags per 100 acres) is typically met through use of Harvest Type D through I. See Appendix C for a listing of mitigation measures by harvest unit.

In Southeast Alaska, precommercial thinning is the preferred silvicultural treatment in regenerated stands and also has been widely used to enhance young-growth habitat for wildlife (see Silviculture section). Since this technique results in uniform tree growth, it may not achieve the desired effect of enhancing diversity levels within regenerating stands. Consequently, the specific benefits to wildlife are the subject of recent debate and studies are currently underway to assess the effectiveness of this enhancement program (DellaSala et al. 1993). The proposed Harvest Types provide an opportunity to determine the effectiveness of different methods for maintaining structural diversity within regenerating units and their use by wildlife. Such techniques would require follow-up monitoring to determine their effectiveness and the need for further design modifications.

All of the above measures would be used as wildlife mitigation in the Lab Bay Project. Although the above recommendations likely would increase stand-level diversity in regenerating forests, they are not intended to compensate for landscape diversity losses. Furthermore, small old-growth islands may only produce a positive mitigative effect when the total area harvested is not

significantly increased to account for reductions in volume associated with structure retention. Increasing the total area harvested to compensate for old-growth islands could increase overall fragmentation in the Project Area and further reduce landscape diversity levels. The measures discussed above have been designed to increase structural diversity while minimizing timber volume losses within harvest units.

Protection Measures

The following additional mitigation measures are proposed to provide protection for wildlife from human disturbance both during and after harvest operations.

1. Existing and proposed roads would be managed to discourage or prohibit motorized use following harvest activities to minimize human disturbance to wildlife (i.e. reduce road densities) and to limit entry into valuable wildlife areas. A list of road systems on which post-harvest use would be discouraged or prohibited for wildlife protection is presented in Appendix I. For a more detailed presentation of access management, see Transportation and Facilities.
2. Harvest unit and road construction activities would be restricted during critical periods when and where Vancouver Canada geese or trumpeter swans might be disturbed.
3. The timing of helicopter logging, the helicopter flight paths and blasting for road construction would be restricted near occupied bald eagle nest sites.
4. Restrict harvest and road construction during wolf mating, denning and rearing periods within one-half miles of dens.

Monitoring

A variety of forest-wide monitoring activities are proposed in the TLMP Draft Revision (1991a) to verify that standards and guidelines affecting wildlife have been implemented and that they are being effective. Monitoring activities directed specifically at wildlife habitat include: field monitoring to verify that wildlife habitat standards and guidelines are being implemented and are effective (Wildlife Habitat Monitoring Items 1 and 2); monitoring to determine if wildlife enhancement projects are producing anticipated outputs (Wildlife Habitat Monitoring Item 3); and monitoring to validate the wildlife habitat capability models for MIS (Wildlife Habitat Monitoring Item 4).

Project-specific monitoring has been identified to monitor the implementation and effectiveness of the four types of clearcutting with reserve trees prescribed for Lab Bay Project units as an ecosystem management measure. This monitoring should include the preparation of a brief report by wildlife and visual resource specialists, based on ground observations and comparisons with units cards and silvicultural prescriptions for approximately 20 percent of the units (see Chapter 2).

Threatened, Endangered, and Sensitive Species

Key Terms

Category 2 Candidate - A species or group of species being considered by the U.S. Fish and Wildlife for listing as endangered or threatened, but for which conclusive data is lacking on its biological vulnerability and degree of threat. Currently called Species of Concern.

Endangered - A species in danger of extinction throughout all or a significant portion of its range.

Sensitive - Species (identified by the regional Forester) whose population viability is of concern on national forests within the region, and which may need special management to prevent their being placed on State or Federal threatened and endangered species lists.

Threatened - A species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Affected Environment

Federally listed threatened and endangered species are those plant and animal species formally listed by the U.S. Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS), under the authority of the Endangered Species Act of 1973 (ESA), as amended. Candidate species are those being considered for listing as threatened or endangered by the USFWS and NMFS. The State of Alaska has an Endangered Species Law which authorizes the commissioner of the Alaska Department of Fish and Game (ADF&G) to list Alaska endangered species. The Regional Forester can also designate species as "Sensitive". Sensitive species are those plant and animal species whose population viability is a concern, or whose current populations and/or habitats are reduced or restricted, or those that are considered vulnerable to various management activities. Special management emphasis is needed to prevent the species from becoming threatened or endangered.

Fish

No threatened, endangered, candidate, or sensitive fish species are known to occur in the Lab Bay Project Area.

Plants

The policy of the Tongass National Forest is to "manage plants in order to maintain viable populations and to avoid actions that may cause a plant to become listed as threatened or endangered" (TLMP Draft Revision 1991a). Plants of concern are those listed by the USFWS as endangered or threatened under the ESA, or a species is identified as sensitive by the Regional Forester. Currently, no plant species native to Southeast Alaska are Federally listed as endangered or threatened. However, four species are currently considered Category 2 Candidate Threatened or Endangered Species (TLMP Draft Revision 1991a). Category 2 species are now formally known as Species of Concern. These are species for which the Fish and Wildlife Service has available scientific information which indicates populations may be declining or facing threats. (USDI Fish and Wildlife Service 1996). Species of Concern are referred to as Category 2 species throughout this document. To date, none of these species have been found in the Tongass National Forest.

Twenty-two plant species were designated sensitive by the Regional Forester in January 1994 (USDA Forest Service 1994c). Eleven are known or suspected to occur on the Thorne Bay Ranger District, which includes the Lab Bay Project Area. Field inventories of potential units and roads were conducted in 1992. Field crews were cross-trained in identification of proposed sensitive plant and animal species in addition to their primary resource areas. Additional sensitive plant surveys were conducted during summer 1995 coincident with supplemental goshawk surveys and timber stand exams. None of the Forest Service sensitive species have been identified within areas to be affected by the proposed Lab Bay timber sale.

Wildlife

One Federally endangered and one Federally threatened wildlife species, the humpback whale *(Megaptera novaeangliae)* and Steller sea lion *(Eumetopias jubatus),* respectively, are expected to migrate through the waters adjacent to the Project Area. Five Federal candidate Category 2 species, the Queen Charlotte goshawk *(Accipiter gentilis laingi)*, Alexander Archipelago wolf *(Canis lupus ligoni),* marbled murrelet *(Brachyrampus marmoratum)*, olive-sided flycatcher *(Contopus borealis)*, and western spotted frog *(Rana pretiosa)* potentially occur in the area. In addition, three Forest Service-designated sensitive species may occur within the Project Area as well as one candidate species.

Information on TES species distributions and occurrences in the Project Area was obtained from agency contacts, a review of the available literature on TES in Southeast Alaska, and a general walk-through of each proposed harvest unit by ID survey teams.

Humpback Whale (Federally and State Endangered)

The population of humpback whales (*Megaptera novaeangliae*) in the North Pacific is estimated to be 1,200 animals. They are more numerous in Southeast Alaskan waters than any other endangered whale and have been observed in every month of the year. Humpback whales range widely from the subarctic boundary north to the Chucki Sea during the summer breeding season. Approximately 300-350 humpback whales inhabit Southeast Alaska waters during summer and autumn with the highest concentrations occurring in near shore waters.

In the Project Area, humpback whales use Shakan Bay, California Bay, Clarence Strait, and Kashevarof Passage (Alaska Natural Heritage Program 1992b). They were also observed in waters off Point Baker during the 1992 summer field season.

Steller Sea Lion (Federally Threatened)

The range of the Steller sea lion (*Eumetopias jubatus*) extends from Hokkaido, Japan, through the Kurile Islands and Okhotsk Sea, Aleutian Islands and central Bering Sea, Gulf of Alaska, Southeast Alaska, south to central California. Of these geographic areas, the Gulf of Alaska and Aleutian Islands are the centers of distribution and abundance.

Significant declines in sea lion numbers have occurred in areas from the Kenai Peninsula to Kiska Island and also on the Kurile Islands, Russia. However, the exact causes for the declines in sea lion numbers throughout most of their range have not been determined. Factors that have been suggested as potential causes of decline include 1) reduced prey availability; 2) disease; 3) direct kills as a result of previous commercial harvests; 4) continued subsistence harvest; and 5) disturbance (Hoover 1988).

There are no documented occurrences of Steller sea lions in the Project Area (Alaska Natural Heritage Program 1992b); however, a haul out has been located on the southern point of Grindall Island, adjacent to Kasaan Peninsula, approximately 55 miles south of the Project Area. Waters adjacent to Prince of Wales Island are used during seasonal migrations (Alaska Natural Heritage Program 1992b).

Queen Charlotte Goshawk (Federal Candidate [C2] Species; USFS Sensitive Species)

The Queen Charlotte goshawk (*A. g. laingi*) is one of three recognized subspecies of northern goshawk breeding in North America (Johnsgard 1990). It is endemic to Southeast Alaska and coastal British Columbia and is probably a resident throughout its range (Taverner 1940).

Goshawk

The primary breeding habitats of the northern goshawk in Southeast Alaska are stands of moderate to high volume old growth, with an open subcanopy layer, located on flat to moderate slopes at lower elevations (typically less than 800 feet elevation) (Titus et al. 1994). Key habitat features include the presence of large trees and closed forest canopies (Crocker-Bedford 1992). Large trees provide important nesting and perching sites for goshawks, and closed forest canopies provide a favorable microhabitat for nesting.

Goshawks occupy extensive home ranges (Johnsgard 1990). ADF&G and Forest Service biologist collected and analyzed radio relocation information on 17 radio-tagged adult goshawks between June, 1992 and November, 1993. From this information, total and breeding home range sizes were calculated for each individual goshawk. Total home range size (using 90 percent harmonic mean) varied considerably, from 625 acres to 283,498 acres for individual birds. Breeding home range size (using 90 percent harmonic mean) varied from 108 acres to 25,645 acres (excluding females that abandoned the nest prior to juvenile dispersal) (Titus et al. 1994). These home range sizes are significantly larger than those found in other parts of the northern goshawk's range. Elsewhere typical home range size was between 5,000 and 8,000 acres during the nesting season (Crocker-Bedford 1992).

Goshawk relocations in Southeast Alaska have occurred primarily in old-growth forest (90 percent). Of the remaining 10 percent of the relocations, 5 percent were in previously harvested stands (including mature second growth, young second growth, and recent clearcuts) and 5 percent were in unforested habitat or stands of less than 8,000 board feet per acre (noncommercial). In addition, it appears that goshawk home ranges increase as harvest increases within their home range.

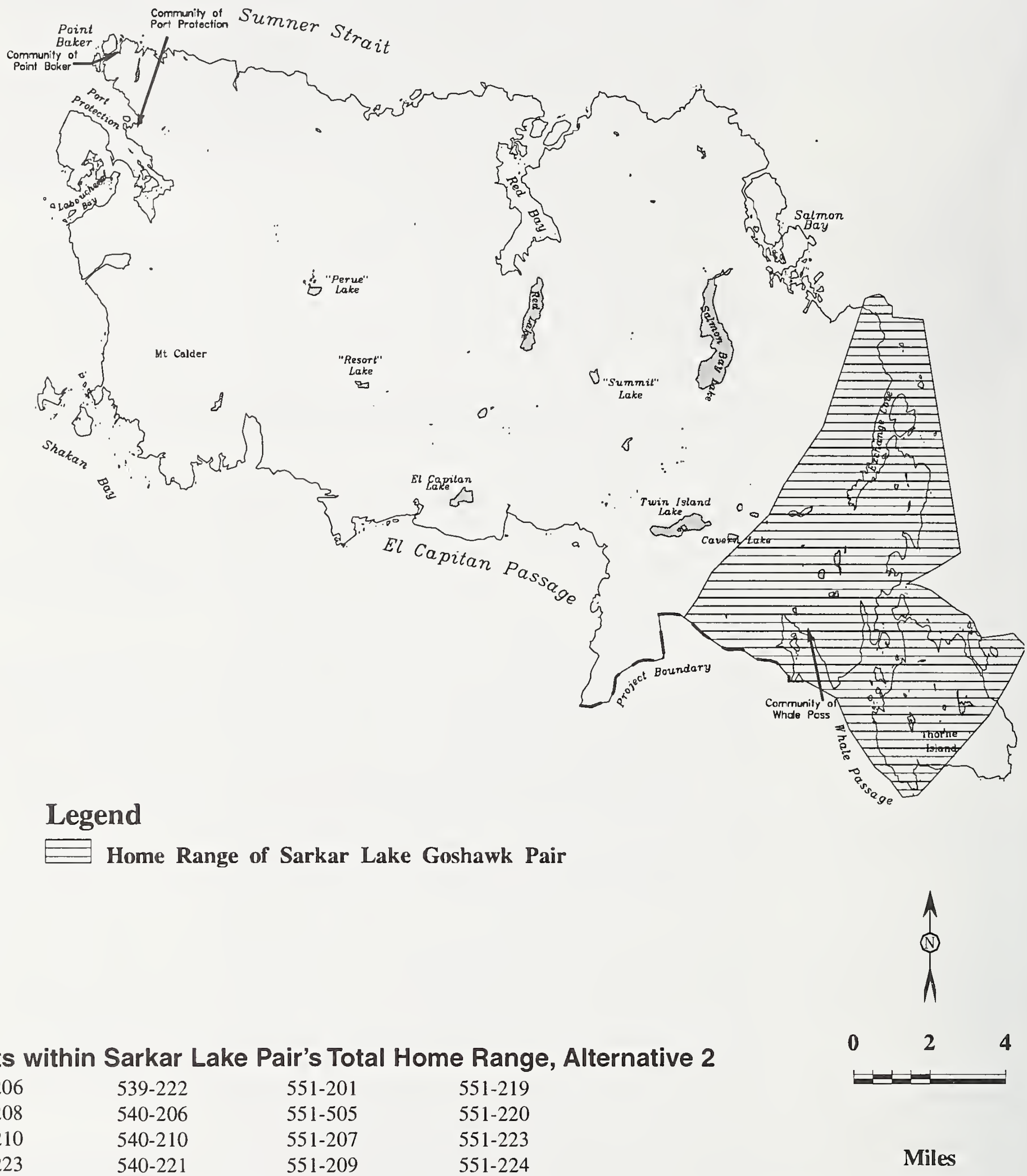
The Queen Charlotte goshawk population in Southeast Alaska is currently estimated at between 200 and 500 pairs (Crocker-Bedford 1992). Based on this estimate, average density in Southeast Alaska may range from 0.2 to 0.5 pairs per 10,000 acres of forested land, which includes muskegs with shrub forest (Crocker-Bedford 1992). Four goshawk nests, Sarheen, Sarkar Lake, Logjam Creek, and Rio Roberts have been identified on Prince of Wales Island. The Rio Roberts nest site was located in 1995; of the remaining nest sites, none were active in 1995 and the radio-tagged birds associated with these areas have all been found dead (per comm. C. Crocker-Bedford).

A proposed TLMP amendment was developed for the Queen Charlotte goshawk (USDA Forest Service Draft EA 1994). Under this plan, commercial harvest would be deferred within the estimated total home ranges of all goshawk nests, confirmed or probable, located prior to 1994. For nests with adult goshawk radio-telemetry data, the home ranges are based on this data. For nests without such data, the home ranges have a radius of 8.4 miles around nests. For goshawk nests documented in 1994 or later, the plan for goshawk habitat management would include a 30-acre nest area within which no vegetative manipulation should be allowed, and a 600-acre post-fledging area within which no commercial timber harvest should be allowed. A 6,000-acre circular foraging area is also designated, within which 20 percent of the area should be in timber stands meeting specific habitat criteria. The recently published 1996 TLMP Draft Revision includes updated standards and guidelines for protection of goshawk nest sites.

The Sarkar Lake pair was identified and radio-tagged in 1992. Total home range of this pair extends into the southeastern portion of the Lab Bay Project Area, encompassing Exchange Cove and the majority of Thorne Island (see Figure 3-22A).

During the 1992 field season, potential goshawk sightings occurred in Units 527-206, 527-225, 527-227, 530-240, 531.1-221, 536-209, and 536-211. Additional unconfirmed sightings occurred west of Salmon Bay Lake, southwest of Twin Island Lake, and north of Whale Pass. The Sarkar

Figure 3-22A
Goshawk Home Ranges Within the Project Area*



Units within Sarkar Lake Pair's Total Home Range, Alternative 2

535-206	539-222	551-201	551-219
538-208	540-206	551-505	551-220
538-210	540-210	551-207	551-223
538-223	540-221	551-209	551-224
539-210	540-223	551-213	551-227
539-215	540-224	551-214	551-230
539-220	540-225	551-216	551-268
539-221			

* Source: Based on 95% harmonic mean of the combined annual home ranges of the Sarkar Lake pair.

Lake pair has been known to use the Lab Bay Project Area and the sightings may have been of this pair.

Goshawk surveys were conducted in 26 proposed harvest units in 1993, in five proposed harvest units in 1994, and in 48 proposed harvest units in 1995. There were no detections of goshawks.

Alexander Archipelago Wolf

This species is also designated as a Management Indicator Species, and as such, is addressed in Wildlife section.

Marbled Murrelet (Candidate [C2] Species)

Marbled murrelet (Brachyramphus marmoratus)

The marbled murrelet (*Brachyramphus marmoratus*) is a small seabird belonging to the family Alcidae. This species is primarily a near-shore feeder in shallow, ocean waters (Marshall 1988). Inland saltwater areas, and occasionally inland freshwater lakes, are also used (Carter and Sealy 1984, Marshall 1988). Food consists mainly of small fishes and invertebrates.

Populations centers of marbled murrelets appear to be restricted to mature or old-growth forests. Actual nest sites are frequently on large, flat, often moss-covered limbs high above the ground. Common use of moss for the nest substrate may be significant because lush moss does not appear on conifers of the Northwest until the forest is 150 or more years of age (Marshall 1988). Open crown structure is characteristic of Pacific Coast old-growth stands and has been considered an important habitat factor because it allows birds easy access between the nest and the forest exterior (Marshall 1988). However, nest trees in Oregon were located in stands with both open and closed canopies (Nelson and Hamer 1992).

Three nest trees have been found in Southeast Alaska: one on Baranof Island and two on Prince of Wales Island. The first nest on Prince of Wales Island was located on August 19, 1992 on the east side of Twelve Mile Arm. The second nest was found on July 27, 1993 in the Logjam Creek drainage. The nest was on the roots of a western hemlock that was situated on the edge of an 11 meter cliff. In the Project Area, murrelets were seen or heard in 1992 just south of Perue Lake and at the east end of Neck Lake. The forest stand at Perue Lake was composed of western hemlock, western red cedar, and Sitka spruce. At Neck Lake, a single bird (possibly a fledgling) was observed on the ground in an area of second growth; however, an old growth stand was located nearby. Additionally, several suspected nesting areas have been found on Prince of Wales Island. These include highland old-growth forest areas within the Red Lake drainage, and northern drainages from Alder Creek around Point Protection to Hole-in-the-Wall Lake (Alaska Natural Heritage Program 1992b).

Although nest data indicate that murrelets in Southeast Alaska may use mature or old-growth forests exclusively (Nelson and Hamer 1992), use of second-growth forest apparently has not been thoroughly researched in Alaska. However, inland surveys of mature, second-growth, and old-growth forests in California indicate that the vast majority of individuals are associated with old-growth forests during the breeding season (Ralph et al. 1990). Coastal surveys during the breeding season also indicate that most marbled murrelets occur offshore opposite old-growth or mature forest stands (Marshall 1988).

Murrelet surveys conducted on the Control Lake Project Area documented presence in 96 percent of the stands surveyed. Occupancy (i.e. circling behavior) was noted in 40 percent of the stands. Use of the Lab Bay Project Area is anticipated to be similar to that found on the Control Lake Project Area.

In 1994 surveys were conducted to determine marine bird and sea otter abundance for Southeast Alaska. The study found that murrelets (marbled and Kittlitz's sightings were combined) were distributed fairly evenly throughout Sourtheast Alaska, with the highest densities occurring in the inside waters. Their population estimates of murrelet abundance in Southeast Alaska was 687,061 birds. Surveys identified high densities of murrelets concentrated in the waters surrounding the Lab Bay Project Area.

Harlequin Duck (Candidate [C2] Species)

Alaska supports a majority of the world population of harlequins (Bellrose 1980, Palmer 1976) with large concentrations occurring in Southeast Alaska, Prince William Sound, the north Gulf Coast, and (especially during winter) the Aleutian Islands (Gabrielson and Lincoln 1959; Isleib and Kessel 1973). In Prince William Sound, the U.S. Fish and Wildlife Service estimated in excess of 10,000 harlequin ducks during October 1971 (Isleib and Kessel 1973).

Harlequin duck breeding areas include coastal and interior rivers, often turbulent glacial streams, coastal and interior lakes and ponds, and coastal islands and rocky shores. In northeast Prince William Sound, birds were most numerous near coastal breeding streams in mid to late-May (Dzinbal 1982). Nests may be located in forested regions and occasionally on open tundra (American Ornithologists' Union 1983) from near sea level to 2,100 m elevation (Campbell et al. 1990). Harlequins winter in near shore coastal waters adjacent to rocky shores and bays, where they often feed in kelp beds (Campbell et al. 1990).

There is no information available on the use of the Project Area by breeding harlequin ducks. In Alaska, harlequins breed primarily along the coast from Southeast Alaska to the Alaska Peninsula (Johnsgard 1975). Coastal streams in this area may contribute substantially to the annual global production of harlequins (Dzinbal 1982). No harlequin duck were observed during field reconnaissance.

Olive-sided Flycatcher (Candidate [C2] Species)

The olive-sided flycatcher breeds in wooded regions from central Alaska east to Newfoundland and south to northern Baja California and central Arizona in the West, central Minnesota and northern Michigan in the Central States, and North Carolina and Tennessee in the East. The species winters in South America. It inhabits coniferous forests, burns, clearings, and forest edges along lakes, streams, and muskegs (Whitney 1985). Olive-sided flycatchers were observed in the Project Area during summer field surveys.

Spotted Frog (Federal Candidate [C2] Species)

In Southeast Alaska, the spotted frog (*Rana pretiosa*) is found from the Taku River south to at least Vank and Mitkof Islands (Alaska Natural Heritage Program 1992b). Although its status in the study area is unknown, literature records indicate that it may occur on or near Prince of Wales Island (Hodge 1976).

The spotted frog frequents the grassy margins of streams, rivers, and lakes. It is extremely aquatic, and is rarely found far from permanent water. In Yellowstone National Park, spotted frogs ate a broad range of insects in addition to a few kinds of mollusks, crustaceans, and arachnids (Nussbaum et al. 1983). A major threat to the survival of spotted frogs are introduced bullfrogs that establish healthy populations (Nussbaum et al. 1983).

Trumpeter Swan (USFS Sensitive)

Trumpeter swans (*Cygnus buccinator*) breed in northern and western Alaska, widely in central and southern Alaska, and locally from southern British Columbia, west-central and southern Alberta, and southwestern Saskatchewan south to southeastern Oregon, eastern Idaho and northwestern Wyoming (American Ornithologists' Union 1983). The majority of swans winter from southern Alaska, western British Columbia, southern Alberta and Montana south to northern California (American Ornithologists' Union 1983).

Breeding habitat includes wetland areas with reeds, sedges or similar emergent vegetation, primarily on freshwater but occasionally in brackish situations. In Alaska, horsetails and sedges are frequently used for nests (Bellrose 1980). The nests are placed in water 1 to 3 feet deep, and the same nest site is often used for several years (Bellrose 1980). Swans winter on open ponds, lakes, and sheltered bays.

There are no records of trumpeter swans nesting in the Project Area; however, swans are known to winter on interior freshwater lakes on Prince of Wales Island. Wintering Trumpeter Swans

were observed at Calder Bay, Salmon Bay Lake, Exchange Cove, Sinkhole Lake, and Alder Creek during surveys conducted between 1989 and 1993 (USDA Forest Service, Unpublished Data). Numbers of birds using interior and coastal locations during migration is unknown.

Peale's Peregrine Falcon (USFS Sensitive)

All three of the recognized North American subspecies of peregrine falcon (*Falco peregrinus*) breed in Alaska (American Ornithologists' Union 1957). Only Peale's peregrine falcon *(F.p. pealei)* is known to occur regularly in Southeast Alaska; the other two subspecies are believed to migrate through the region. The population of Peale's peregrine falcon in Southeast Alaska was estimated at about 25-30 pairs (Johnsgard 1990). During the 1992 field season, there was a single unconfirmed sighting of a peregrine falcon in the Project Area.

During the nonbreeding season, the peregrine falcon prefers habitats that support numbers of shorebirds, waterfowl, and other small to medium-sized birds (Johnsgard 1990). Coastal habitats during this season include beaches, tidal flats, islands, marshes, estuaries, and lagoons. Presumably, birds in coastal Southeast Alaska use similar habitats and prey species. Peregrine falcons breeding on the coast are usually found in the vicinity of colonial nesting seabirds (Campbell et al. 1990).

In British Columbia, coastal nest sites were associated with cliff ledges or trees on islands, with the exception of the Queen Charlotte Islands and northern Vancouver Island, where headlands were also used (Campbell et al. 1990). The vast majority of coastal nests in British Columbia were situated on ledges of vertical rocky cliffs (Campbell et al. 1990).

Osprey (USFS Sensitive)

In the Western Hemisphere, the osprey (*Pandion haliaetus*) breeds from northwestern Alaska and central Canada south to the Bahamas and Mexico. Ospreys winter from the southern United States south to Chile and Argentina.

Osprey breeding habitat includes 1) an adequate source of fish that can be captured near the water surface, and 2) an elevated nest site within a few kilometers of the food supply (Johnsgard 1990). Nests may be located in the vicinity of lakes, rivers or marine shores. Nest sites preferably are dead or open-topped live trees, but in some locations rock outcrops, cliffs, and artificial structures such as utility poles are used (Johnsgard 1990).

Eight osprey nests have been located in Southeast Alaska, primarily on islands near the mouth of the Stikine River (Alaska Natural Heritage Program 1992). There currently are no nest records for Prince of Wales Island.

Prince of Wales Flying Squirrel (Former Candidate Species)

The Prince of Wales flying squirrel (*Glaucomys sabrinus griseifrons*) is one of twenty-five subspecies of northern flying squirrels that occur in forested regions throughout most of northern North America (Suring 1993a). It is found only on Prince of Wales Island. Although little is known about its population status or distribution, flying squirrels are frequently seen on Prince of Wales Island by trappers (Alaska Natural Heritage Program 1992b).

The association of northern flying squirrels with old growth forests throughout their range is well documented (Suring 1993a). The attributes of old growth forests that have been identified as important to flying squirrels are 1) availability of denning habitat (natural tree cavities and woodpecker excavations are used to large extent as den sites); 2) foraging habitat (studies indicate that fungi and lichens, which are commonly available only in old growth forests, are major food sources for northern flying squirrels); and 3) protection from predators.

Effects of the Alternatives

Introduction

This analysis of the environmental consequences of the action alternatives on threatened, endangered, sensitive and candidate species considers the direct, indirect, and cumulative effects of timber harvest in the Project Area. Direct and indirect effects are projected to 1997, the antici-

pated end of implementation of the Lab Bay Project; to 2004, which includes the reasonably foreseeable future and the end of the KPC Long-term Sale Contract; and to 2054, to show the cumulative impacts of harvesting all the proposed suitable Commercial Forest Land through the first rotation and to show the cumulative impacts of past and proposed timber harvest.

Plants

No federally listed threatened or endangered plants are known to occur in the Lab Bay Project Area. None of the four federal Category 2 Candidate threatened or endangered species are known to occur in the Project Area. Therefore, no impacts to federally listed species are expected.

Of 22 species listed as sensitive by the Regional Forester, 11 are known or suspected to occur on the Thorne Bay Ranger District. None of the sensitive species is known to occur in areas proposed to be harvested.

Wildlife

Humpback Whale

No reduction or alteration of humpback whale habitat would occur as a result of any of the alternatives; therefore, no adverse effects are anticipated.

Steller Sea Lion

No reduction or alteration of Steller sea lion habitat would occur as a result of any of the alternatives; therefore, no adverse effects are anticipated.

Queen Charlotte Goshawk

Habitat of the Queen Charlotte goshawk, an old growth-dependent species, would be reduced under all of the action alternatives.

A proposed TLMP amendment for goshawks has been developed by the Tongass National Forest (USDA Forest Service 1994b) to protect the habitat of identified nesting goshawks. As discussed in the Affected Environment section, nests found prior to 1994 would receive habitat protection within their total home range or within an 8.4 mile radius, depending on whether radio-relocation information was available to determine total home range. The total home range of the Sarkar Lake pair, located in 1992, extends into the southeast portion of the Lab Bay Project Area, encompassing VCU 540, and portions of 535, 538, 539, and 551 (Thorne Island). Within the Sarkar Lake pair's total home range, Alternative 2 would harvest 29 units (1,103 acres); Alternative 3 would harvest 24 units (881); Alternative 4 would harvest 15 units (583 acres), plus 152 acres of uneven-aged harvest on Thorne Island; and Alternative 5 would harvest 21 units (788 acres) (Figure 3-22). The 1996 TLMP Draft Revision proposes updated standards and guidelines for protection of goshawk nest sites. The most current management direction will be applied to any nest sites located during sale layout and harvest.

Implementation of an HCA strategy, proposed under Alternatives 3, 4, and 6, would maintain large blocks of old-growth habitat in a relatively unfragmented condition, the preferred habitat of the Queen Charlotte goshawk. The Project-defined COGA/Corridor Strategy proposed under Alternative 4 is anticipated to be the most effective for the goshawk because it would maintain larger, more contiguous blocks of old growth than is proposed under the Draft Interim HCA Strategy (included as part of the framework of Alternatives 3 and 6).

Goshawk surveys have been conducted in the Project Area, with no response. However, if a nest is found during final layout, the proposed guidelines include maintenance of a 30-acre forested area around the nest tree where no vegetative manipulation is permitted. Various levels of habitat alteration are allowed in the 600-acre post-fledgling and 5,000-8,000 acre foraging areas. Sufficient habitat would be maintained under all alternatives to contribute to the maintenance of viable goshawk populations.

Alexander Archipelago Wolf

Project effects on the wolf are addressed in the Wildlife section.

Marbled Murrelet

Loss of old-growth and mature forest is considered the principal threat to the marbled murrelet throughout its range (Marshall 1988). Timber harvest under all action alternatives would decrease old-growth forests within the Project Area. Because it is not known which of the various old-growth associations are suitable habitat for murrelet nesting, it is difficult to quantify impacts of logging (Mendenhall 1992).

Although murrelet activity was observed just south of Perue Lake and at the east end of Neck Lake, the only direct evidence of nesting in the Project Area in 1992 was in Unit 531.1-223 where a suspected fledgling was found on the ground. Harvest of this unit is not proposed under any of the alternatives. Future harvest of Unit 531.1-223 would remove an 82-acre section of the South Perue old-growth block, which totals about 1,700 acres in size. It is anticipated that removal of old-growth habitat would reduce the carrying capacity of the Project Area for breeding murrelets.

Harlequin duck

Harlequin Duck

It has been suggested that harlequin populations are regulated to some degree by the quantity of food available on the breeding grounds (Bengston 1972). Consequently, timber harvesting operations that disturb salmon spawning beds or cause siltation in intertidal deltas adjacent to nesting creeks should be avoided.

Human disturbance and removal of nesting cover adjacent to streams may reduce the carrying capacity of an area for harlequin ducks. Although there are no nest records for harlequin ducks in the Project Area, coastal streams on Prince of Wales Island should be considered potential nesting habitat. By providing a minimum 100-foot No Commercial Harvest buffer on Class I and most Class II streams, the Stream and Lake Protection LUD would help ensure the availability of nesting habitat for harlequins.

Olive-sided Flycatcher

Riparian habitats along all lakes, rivers, and streams on the Forest would be managed according to the Stream and Lake Protection management prescription or a more restrictive prescription (such as when a stream or river has Wild or Scenic status). Created openings would produce greater edge, and the partial cutting and clearcut types prescribed, would retain varying levels of reserve trees and snags. Therefore, the Project may affect olive-sided flycatcher habitat, though the effect is likely to be positive.

Spotted Frog

There are no recent records of spotted frogs in the Project Area; however, they may inhabit muskeg, peatlands, and the margins of streams and lakes. It is unlikely that proposed timber harvest would affect the spotted frog population.

Trumpeter Swan

Trumpeter swans nest in wetlands and winter on ponds, lakes, and sheltered bays. The protection provided by the Stream and Lake Protection LUD, as well as the Beach Fringe and Estuary LUD, should be adequate to ensure future use of these areas by trumpeter swans. Although no nests have been located within the Lab Bay Project Area, wintering swans have been observed at Calder

Mature Trumpeter Swans

Bay, Salmon Bay Lake, Exchange Cove, Sinkhole Lake, and Alder Creek (USDA Forest Service, unpublished data). During critical periods of the year (nesting, brood rearing, molting, and wintering), human activities would be avoided within a minimum 0.5 mile radius of trumpeter swan habitat where swans are present (TLMP Draft Revision 1991a). Timing restrictions are recommended on one unit near Calder Bay (531.1-257); 3 units near Exchange Cove (539-220, -221, -222); and five units near Alder Creek may be affected (529-285, -259, -257, -284, -202), if swans are reported to be wintering in these areas. Implementation of timing restrictions would also occur if swans are observed in the Project Area during the other critical periods (i.e. nesting, brood rearing, and molting). See the Transportation, Logging, and Facilities section for detailed discussion of timing restrictions.

Peale's Peregrine Falcon

There are no nest records for peregrine falcons in the Project Area. Actual migration routes and major foraging areas of peregrine falcons in Southeast Alaska have not been identified. Forest-wide standards and guidelines have been developed to protect seabird rookeries and waterfowl concentration areas. Also, a variety of passerine birds, a common prey item, would be available from both open and forested habitats.

Osprey

No osprey nests have been recorded in the Project Area. Because osprey nest requirements are similar to those of the bald eagle (dead and open-topped live trees near the water), protection of habitat surrounding the beaches, estuaries, and major streams should help guarantee that potential osprey nest sites are not jeopardized by the harvest alternatives.

Prince of Wales Flying Squirrel

Loss of old-growth and mature forest is considered the principal threat to flying squirrels due to the associated reduction of food availability, cavity shelters, and an increase in predators (Carey 1991).

In Southeast Alaska, a 1,000-acre stand of old-growth forest is assumed to provide habitat for 20 to 40 flying squirrels. To ensure interchange of individuals between habitat patches, it may be necessary to maintain at least one 1,000-acre stand in each major watershed and provide travel corridors between patches.

Old-growth habitat would be reduced by varying degrees under all of the action alternatives.

Cumulative Effects

Cumulative effects are the result of changes in the environment caused by the interaction of natural ecosystem processes and the effects of multiple management actions. Wildlife habitat and associated populations of threatened, endangered, and sensitive species may be influenced by the result of multiple entries to remove timber within the Project Area, and the combined or synergistic effects of habitat loss in adjacent areas. The humpback whale, Steller sea lion, spotted frog, and trumpeter swan are unlikely to experience long-term cumulative effects because of their limited use of the area or because their habitats are unaffected or minimally affected by timber harvest. The populations of northern goshawk and marbled murrelet, however, may experience significant long-term cumulative effects.

Cumulative harvest acreages and distribution are discussed in the Silviculture and Wildlife cumulative effects sections of this chapter. As noted in those sections, by the year 2054, scheduled harvest shifts from old growth to second growth, and most previously harvested suitable stands would be maintained as second growth. Under the desired future condition, the remaining old-growth forest in the Project Area would be confined to isolated blocks located within the Calder/ Mt. Holbrook LUD II and the Salmon Bay LUD II, in linear patches of old-growth forest maintained within mandated and prescribed buffers, and in small patches of unsuitable CFL. Although linear patches would in some cases function as linkages to other forest blocks and as travel corridors for some wildlife, it is doubtful that they would provide adequate habitat for northern

goshawks, which require large blocks of intact old-growth forest, or sufficient nesting habitat to maintain current population levels of marbled murrelets. The Prince of Wales flying squirrel would be confined primarily to two distinct locations of the Project Area (Salmon Bay and Mt. Calder/Mt. Holbrook LUD II's).

The northern goshawk may be particularly susceptible to long-term cumulative effects because of its low population in Southeast Alaska and its apparent dependence on the characteristics of old-growth habitat for all aspects of its life cycle. The reduction in unfragmented old-growth habitat for foraging and nesting under long-term harvest conditions within the Lab Bay Project Area increases the possibility of adverse effects on the northern goshawk. In addition to TLMP (1979) and the LUD strategy proposed under TLMP Draft Revision (1991a), three other conservation biology strategies have been developed for the Lab Bay Project Area. Each would retain a different level of old-growth habitat and connectivity within the Project Area. For a discussion of each of these strategies, see the Wildlife Cumulative Effects section. The 1996 TLMP Draft Revision addresses the issues of old-growth habitat management on a Forest-wide basis. Once a Forest Plan Revision is adopted it will provide Forest-wide direction for future old-growth management.

Mitigation

Mitigation for threatened, endangered, and sensitive species results primarily from avoidance of known special use sites such as nests, dens, and haulout areas for sea lions. The final unit layout and road location would provide one more level of observation and opportunity for avoidance of any special use sites.

Seven possible goshawk sightings were made during the 1992 field investigations. Goshawk surveys were conducted during the 1995 summer field season and included areas of past sighting and harvest units within high probability goshawk habitat (Mitigation Measure W5). Forty-eight units were surveyed with no goshawk responses. Region 10 goshawk management guidelines will be implemented if a nest is identified prior to final layout.

Trumpeter swans would be protected by restricting harvest unit and road construction activities during critical time periods when and where trumpeter swans might be disturbed (Mitigation Measure W7).

For humpback whales, mitigation measures would include: 1) the avoidance of Forest Service-approved aircraft flights below 500 feet above sea level in the known vicinity of whales; 2) the avoidance of the intentional approach of Forest Service vessels of 100 feet or more in length within one-quarter mile of whales; 3) the avoidance of approach of Forest Service vessels of less than 100 feet in length to within 100 yards of whales; and 4) the avoidance of inappropriate disposal of cables in the marine environment to prevent potential whale entanglement.

Monitoring

A monitoring plan has been developed for the Tongass National Forest by the Forest Planning Team and is described in TLMP Draft Revision (1991a). The Lab Bay Project Area would contribute towards meeting overall Forest Plan monitoring goals through the selection of harvest units/roads for monitoring. Recommendations for monitoring of threatened, endangered, and sensitive species (and their habitats) for the Lab Bay Project Area are documented in the Wildlife, Old Growth, and Biodiversity Resource Report (Confer and Hall 1994), the Timber and Vegetation Resource Report (Boyce 1994), and the project planning record.

Project-specific monitoring that is unique to the Lab Bay Area, and that would not be included in regular Forest Plan or routine implementation monitoring, has been identified for several resources. Project-specific monitoring is not identified for TES species in the Lab Bay Project Area. Chapter 2 summarizes how project activities relate to Forest Plan and Ketchikan Area monitoring plans, and describes project-specific monitoring opportunities.

Land Ownership and Land Use

Key Terms

Alaska Native Claims Settlement Act (ANCSA) - Provides for the settlement of certain land claims of Alaska natives.

Encumbrance - A claim, lien, charge, or liability attached to and binding real property.

Native Selection - Application by Native corporations to the Bureau of Land Management for conveyance of a portion of lands withdrawn under ANCSA in fulfillment of Native entitlements established under ANCSA.

Special Use Permits - Permits and granting of easements (excluding road permits and highway easements) authorizing the occupancy and use of land.

State Selection - Application by Alaska Department of Natural Resources to the Bureau of Land Management for conveyance of a portion of the 400,000-acre state entitlement from vacant and unappropriated National Forest System lands in Alaska, under the Alaska Statehood Act.

Affected Environment

Land ownership in the Lab Bay Project Area is presented on Table 3-93. Over 96 percent of the area is managed by the Tongass National Forest. The Lab Bay Project Area is subdivided into four Management Units: K01 (Sumner Strait), K02 (Salmon Bay), K03 (El Capitan-Whale Pass), and K03A. Management direction within both K02 and K03A emphasize preservation of existing conditions. The management of K01 and K03 emphasizes a variety of land use prescriptions, depending upon the specific land allocation and management objectives.

The Project Area is further subdivided into 22 Value Comparison Units (VCU), roughly equivalent to major watersheds. Each VCU is further divided into different Land Use Designations (LUD's). These are described in detail in Chapter 1, Forest Plan Land Use Designations. Each LUD has a specific set of management prescriptions which direct land use activities.

This EIS tiers to the TLMP (1979, as amended) and the Alaska Regional Guide (USDA Forest Service 1983). It also proposes management consistent with the preferred alternative (Alternative P) in the proposed Draft Revision (TLMP Draft Revision 1991a). In cases of conflicting direction, the more restrictive standards and guidelines were applied.

State Claims

Under the Statehood Act of 1959, the State of Alaska is entitled to select up to 400,000 acres of National Forest System Lands in Alaska. Presently, the State is the second largest landholder in the Project Area, owning or having made application to own 11,350 acres (7 percent) of the land.

Sealaska Corporation is the only Native inholder, with 571 acres of patented mining claims in the vicinity of Calder, and additional parcels totaling 6 acres.

Native Selections and Private Land

In the early 1970's, the pattern of land ownership began to change as a result of the Alaska Native Claims Settlement Act (ANCSA) and the Alaska National Interests Lands Conservation Act (ANILCA). Lands have been transferred from the Forest System to the private sector for townsites and private homes. Approximately 296 acres are in private ownership, including the townsites of Point Baker and Port Protection.

Special Use Permits

Special Use Permits are issued by the Forest Service for specific exclusive uses on National Forest System lands. While there are no Special Use Permits within the Project Area at the current time, the Labouchere Bay logging camp and school are authorized under the Camp Plan provision of the KPC contract.

Table 3-93

Lab Bay Project Area Land Ownership

Owner Category (with Major Subclasses)	Total Acreage	Subclass Acreage*
National Forest System	161,511	
Unrestricted		157,765
With Encumbrance:		
State Selection		7,350
Outstanding Right		39
Imposed Use:		
ANILCA withdrawn		30
Lighthouse (USCG)		69
Alienated		0
Partial Interest		2
State of Alaska Ownership	7,529	
Proposed Easement		196
Point Baker Townsite	291	
Port Protection Townsite	5	
Sealaska Corporation	6	
Other	2,520	
With FS Imposed Use		22
Patented Mining Claims		
Ketchikan Pulp Co.		151
Sealaska		571
Trillium		1,307
Total Acreage	**171,862**	

Source: Ketchikan Area GIS

* Subclass acreage does not encompass total acreage for each ownership category.

Mining Claims

Patented and unpatented mining claims in the Project Area are described in the Geology, Minerals, and Karst section of this document. Patented claims total approximately 2,127 acres in the Project Area. Patent information and local history indicate these claims generated architectural marble which is described as not being very durable. This information indicates that land use on these claims most likely will not be affected by any alternative. Unpatented claims will not restrict any of the proposed activities.

Withdrawals and Permits

The US Coast Guard is granted a withdrawal of 68.10 acres (US 1634, EO 3406) for the lighthouse at Point Colpoys (VCU 534.1). The lighthouse is located offshore on a small island, while the balance of the withdrawal is located within a previously harvested area.

Numerous patents and homesite permits are issued to individuals within state land boundaries at Whale Pass, Port Protection (Wooden Wheel Cove), and Point Baker. In addition, some owners have surface water right certificates for streams or springs which run through their property, and a limited number have applied for private easements. Potential effects at these sites will be discussed below as effects on the communities as a whole. Therefore, although specific information on each permit and patent is available, they will not be listed individually here. Likewise, standard utility easements and right of ways within these areas will not be listed. Other permits and leases which cannot be classified above are listed individually:

1. Whale Pass, located in VCU 538; 3.0 acre Tideland Lease Application (ADL 104794) submitted by Clarence Straits Resorts encompassing tidelands, boat dock, and wood float area.
2. Salmon Bay, located in VCU 535; 5.0 acre Aquatic Farm Permit/Lease (ADL 105329) issued to White Pearl Seafoods and Tripple Chuck Oysters effective 9/1/90. The company moved from this area in early 1995, and the permit was revoked by the state prior to April 1995.
3. Red Bay Lake Cabin, located in VCU 533; Surface Water Rights (LAS 6142) for an unnamed stream appurtenant to the public recreation cabin. Certificate issued to the Forest Service 10/31/86.
4. Memorial Beach Picnic Ground, located in VCU 529; Surface Water Rights (LAS 4788) for an unnamed stream appurtenant to the public picnic area. Certificate issued to the Forest Service 10/31/86.
5. Port Protection, located in VCU 527; 14.23 acre Private Easement (State Patent 6057, ADL 101646) issued to Forest Service effective 5/6/83; expires 5/6/2003.
6. Labouchere Bay, located in VCU 527; Private Easement (ADL 101553) of 75.3 acres for a Log Transfer Facility issued to Forest Service 1/13/83. Approximately 30 acres surrounding the area are also covered under this permit. The permit expires 1/12/2008. The National Pollution Discharge Elimination Permit (NPDES) expires 9/9/97.
7. El Capitan Outcamp, located in VCU 536; Private Easement (ADL 101554) of 74.39 acres on tidelands for a Log Transfer Facility issued to Forest Service 11/14/84. The permit expires 11/13/99. In a related permit (LAS 12622), water rights to an unnamed stream were also granted at the rate of 700 GPD for use on uplands and 700 GPD for use at the camp as described above. The Water Rights Permit was issued 5/21/90.
8. Whale Pass, located in VCU 538; 14.76 acre Tideland Easement Permit (ADL 101569) for a Log Transfer Facility issued 10/18/83. The permit expires 9/9/97. The corresponding Corps of Engineers Permit (2-900527) was issued for an indefinite period to the Forest Service. The National Pollution Discharge Elimination Permit (NPDES) expires 9/9/97.
9. Calder, located in VCU 531.1; 224.69 acre Tideland Easement Permit (ADL 102384) for a Log Transfer Facility issued 12/15/84. A temporary permit for log storage expires 12/31/95 and the permit for the LTF expires 12/15/2009. The Tideland Easement expires 9/9/97. The corresponding Corps of Engineers Permit (071-OYD-2-810086) was issued for an indefinite period to the Forest Service. The National Pollution Discharge Elimination Permit (NPDES) expires 9/9/97.

Effects of the Alternatives

Under Alternative 1, the No Action Alternative, land in the Project Area would remain in its present condition. No timber harvest would occur and no new roads or LTF's would be constructed. Each action alternative (Alternatives 2 through 6) would change present land uses in various parts of the Lab Bay Area. Although the action alternatives offer different options on the degree and location of effects, some would be unavoidable.

Direct Effects

Aside from actual timber harvest, the only direct land use effect from any alternative would be the construction of new roads in the Project Area. New roads could increase use of previously inaccessible areas. Specific information on mileage and other effects for each alternative is provided in the Air Quality, Soils, and Transportation, Logging and Facilities sections of this document. New roads would not be built on non-Forest System land.

Indirect Effects

Indirect effects upon land use by any of the action alternatives includes increased access to previously inaccessible areas, increased/altered traffic, and decreased scenic quality. Conflict with non-Forest System owners over these and other effects is an important concern.

Eight proposed harvest units abut or are in close proximity to non-Forest System land or land with encumbrances. Of these units, two abut non-Forest System land and six are within 1,000 feet of non-Forest System land. A list of these units and their distance from other ownership is defined in Table 3-94.

Table 3-94
Harvest Units Within 1,000 Feet of Non-Forest System Lands

Unit	Distance From Non-FS Land	Ownership	Alternatives
Abutting			
527-206	abutting	State of Alaska	2, 5
538-210[1]	abutting	State of Alaska	2, 3, 4
Adjacent			
527-226[2]	~ 150'	State of Alaska	2, 5
538-208	< 200'	State of Alaska	2, 3, 4
539-222	~ 250'	State of Alaska	2, 4, 5, 6
540-221[1]	~ 475'	State of Alaska	2, 3, 4
540-223[3]	~ 400'	State of Alaska	2, 3, 4, 6
536-211	~ 750'	Trillium	2, 4, 5

Source: Lab Bay Planning Record

[1] This unit is also within 1,000 feet of privately-owned homesites within the Whale Pass Subdivision.

[2] This unit is also within 1,000 feet of privately-owned homesites within the Wooden Wheel Cove Subdivision.

[3] This unit will require a road right-of-way easement from the State.

The current Prince of Wales Island Area Plan published by the Alaska Department of Natural Resources (DNR) outlines land use plans for all state-owned lands. These planned uses are shown in Table 3-95.

Table 3-95
DNR Area Plans for State Lands Abutting or Within 1,000 Feet of Proposed Harvest Units

Location of State-Owned Land	Units	Alternatives	Use
Point Baker & Port Protection	527-206 527-226	2, 5 2, 5	Undeveloped public recreation, settlement, and water resources
Whale Pass	538-210 538-208 540-221 540-223	2, 3, 4 2, 3, 4 2, 3, 4 2, 3, 4, 6	Settlement, comm./indiv. settlement, public facilities, undeveloped public recreation
Selected Lands Near El Capitan Passage	536-211	2, 4, 5	Undeveloped patented mining claim
Selected Lands Near Exchange Cove	539-222	2, 4, 5, 6	Public facilities and undeveloped public recreation

Source: Prince of Wales Island Area Plan, DNR.

Alternatives 2 and 5 would harvest units near Point Baker and Port Protection. While none of these units are within the watersheds of the communities, temporary roads would be constructed. Mitigation described in the Water Resources section would reduce the risk of contamination. Undeveloped public recreation in the area should not be affected. Settlement should be unaffected, with the exception of possible decreased land values due to reduced scenic quality as described in the Visual Resources section of this document.

Alternatives 2, 3, 4, and 6 would harvest units near or abutting state lands and home sites within Whale Pass Subdivision. Harvest of these units would increase traffic on existing roads, but activities should have little effect on the area with the exception of possible decreased land values due to a reduction in scenic quality. Unit 538-210 and approximately 0.3 miles of new road are proposed within an unnamed watershed supplying Whales Resort and several families, as described in the Water Resource section.

Alternatives 2, 4, 5, and 6 include plans to harvest a unit near state-selected lands at Exchange Cove. Onshore area plans by the state include undeveloped public recreation and public facilities. Primary state-planned development is off-shore. This area is currently heavily used by residents of Whale Pass for recreation and is accessible by road. The state also rates the area as having a high value habitat for waterfowl and aquatic species. Proposed logging units are located inland and should have limited effect on the use of this area. An easement from the State will be required for the access road to Unit 540-223.

Adoption of an action alternative could result in some potential for conflict with adjacent land owners. In the case of adjacency, Forest Service land managers typically contact adjacent land owners prior to unit layout and maintain communication throughout layout, flagging and harvest activities. Field efforts in designing preliminary units as part of this evaluation considered and made adjustments to preserve recreation site, views, etc. Land managers will extend this effort prior to and during final unit layout. Property boundary lines would be surveyed prior to final unit harvest layout.

Adoption of any of the action alternatives would have indirect effects upon potential recreational Special Use Permit holders. Although no operators are presently active in the Lab Bay area, harvest activities could temporarily or permanently displace such users.

Monitoring

A monitoring plan has been developed for the Tongass National Forest by the Forest Planning Team and is described in the TLMP Draft Revision (1991a). Chapter 2 summarizes how project activities relate to Forest Plan and Ketchikan Area monitoring plans, and describes project-specific monitoring opportunities.

Project-specific monitoring that is unique to the Lab Bay Project Area, and that would not be included in regular Forest Plan or routine implementation monitoring, has been identified for several resources. Project-specific monitoring is not identified for land ownership in the Lab Bay Area.

Transportation, Logging, and Facilities

Key Terms

Access Management - Acquiring rights and developing and maintaining facilities needed by people to get to and move through public lands.

Arterial Roads - Roads usually developed and operated for long-term land and resource management purposes and constant service.

Board Foot (BF) - A unit of timber measurement equalling the amount of wood contained in an unfinished board 1 inch thick, 12 inches long and 12 inches wide. One MBF = 1,000 board feet.

Cable Yarding - The use of steel towers and wire rope to move logs from the stump to the landing.

Clearcut - Harvesting method in which all trees are cleared in one cut. It prepares the area for a new even-aged stand.

Collector Roads - Collect traffic from Forest Local roads; usually connect to a Forest Arterial road or public highway.

Group Selection - A harvesting method in which trees are removed in small groups.

Landing - Initial location where the logs are placed upon removal from the woods. With cable systems, the yarder operates on the landing.

Local Roads - Provide access for a specific resource use such as a timber sale or recreational site; other minor uses may be served.

Log Transfer Facility (LTF) - A facility that is used for transferring commercially harvested logs to and from a vessel or log raft, or the formation of a log raft.

Logging Settings - A setting generally refers to the area where logs are being delivered to one landing, whether by cable, wheeled or tracked equipment. There are times when a setting may have more than one landing, such as a continuous landing along a road for shovel or swing yarding. The setting is the smallest planning unit that can be dealt with.

MMBF - Million board feet, or about 220 conventional highway logtruck loads of logs.

Marine Benthic Environment - Organisms and substrate found on the bottom in saltwater habitats.

Operability Classes - Logging operations are categorized as Difficult, Isolated, or Normal.

Difficult - Skyline logging systems with spans greater than 2,000 feet and helicopter logging with yarding distances less than 4,500 feet.

Isolated - Helicopter logging with yarding distances greater than 4,500 feet and conventional logging units with a low volume of timber per mile of road necessary for access.

Normal - Shovel, high lead and skyline logging systems with spans less than 2,000 feet.

Partial Cut - Any cutting other than a clearcut. This may include thinning, selection, shelterwood, or an overstory removal.

Temporary Roads - Short-term roads built for limited resource activity or other project needs.

Yarding - Process of moving logs to a landing.

Affected Environment

Transportation

Development of the Road System

The existing road system on Prince of Wales Island provides access for timber management, recreation and subsistence activities, and links the various island communities. This network of roads evolved almost entirely from timber harvest. In the 1950's, Ketchikan Pulp Company constructed roads at Hollis and Coffman Cove. In the early 1960's, this network was expanded to reach logging camps at Thorne Bay, Ratz Harbor, Whale Pass, El Capitan, Naukati, Winter Harbor, Twelve-Mile Arm, and Polk Inlet. Then, in the early 1980's, roads were constructed linking logging camps and communities at Labouchere Bay, Whale Pass, Naukati, and Coffman Cove. Portions of the Project Area remain unroaded, notably Thorne Island.

Current Condition of Road System

The transportation system that exists in the Project Area is comprised almost entirely of forest development roads. These roads are classified as 1) Arterial, 2) Collector, and 3) Local roads.

1. Arterials are the primary roads connecting communities and providing the main access into the forest.
2. Collectors are the secondary roads to smaller land areas. They provide links between Arterials and other Collector roads.
3. Local roads serve even smaller land areas or specific sites. They provide minor linkages with the other roads.

Forest roads are constructed to standards appropriate for the intended use, considering safety, cost of transportation, and effects on lands and resources. Arterial/Collector roads typically are a single lane with turnouts, surfaced with either rough, shot rock or coarsely crushed gravel. Although designed for off-highway loads, Arterial and Collector roads are usually maintained for use by passenger vehicles and are normally traveled at faster speeds than Local roads. The Local roads are single lane with turnouts and are surfaced with rough, shot rock. Local roads generally have poorer alignment, steeper grades and are not designed for low clearance vehicles (passenger cars). Some of the Local roads are closed and impassible as a result of alder growth, physical barriers, or the absence of culverts and temporary bridges; however, the majority of the Local roads are currently open and maintained.

Currently, there are 370 miles of roads within the Project Area. The alternative maps in Chapter 2 display this system. Arterials include Roads 15, 20, 27, 29, and 30. Road 20 is the main travel route in the Project Area, connecting the populated central portions of Prince of Wales Island including Thorne Bay, Craig, Klawock and Hollis. Road 27 is located along Twin Islands Lake and connects Road 20 with Whale Pass. Road 30 extends from the Whale Pass Log Transfer Facility (LTF) to Road 27, and is the main access road to the east end of the Project Area. Road 15 begins on Road 20 near El Capitan Passage and changes to Road 29 near El Capitan Lake. This road traverses private property and is closed to commercial traffic. Road 29 is a continuation of Road 15, provides access to the Calder Bay LTF and currently ends about two miles north of Calder Bay. Road 29 then continues about one mile to the west and connects with Road 20 about three miles to the south of Labouchere Bay.

All of the Arterials in the Project Area, with the exception of Road 15, are in good condition. The Calder Bay side of Road 29 recently was reconstructed and partially rerouted for the 1989-94 Long-term Sale harvests in that area. Approximate vehicle travel times from Labouchere Bay to various locations on Prince of Wales Island are as follows:

El Capitan Forest Service Camp	1.25 hours
Calder Bay LTF	2.50 hours
Whale Pass	1.75 hours
Thorne Bay	5.00 hours
Klawock	5.00 hours
Naukati	2.75 hours

The communities of Port Protection and Point Baker are not connected to the road system; however, some residents park vehicles along Road 20 near Labouchere Bay and reach their homes by boat.

Existing Facilities

Log Transfer Facilities (LTF's)

Removing harvested timber from the Lab Bay Project Area to processing facilities requires both land and water transportation. The link between the road and the waterways are the LTF's. The LTF's provide a means of removing the bundled logs from the trucks and placing them in the saltwater where they are then "rafted" and towed to processing facilities. The presence of multiple LTF's in the Lab Bay Project Area is economically advantageous because water transportation is much less expensive than land transportation.

LTF Status and Location

There are currently three active LTF's serving the Project Area, located at Labouchere Bay, Whale Pass and Calder Bay (Table 3-96). An LTF was formerly located at El Capitan, but it has been removed.

Table 3-96
LTF Type and Location

Site	Type	Latitude	Longitude
Calder Bay	Slide	56°10'40"N	133°28'22"W
Labouchere Bay	Slide	56°18'09"N	133°37'10"W
Whale Passage	A-Frame	56°05'54"N	133°07'42"W

Source: Ketchikan Area GIS

An A-frame LTF consists of a stationary mast with a falling boom for lifting logs from trucks to water. This system generally is located on a shot rock embankment with a vertical bulkhead to access deep water, accommodating operations in all tidal conditions.

A slide LTF, such as at Calder Bay, consists of a gravity ramp for sliding log bundles into the water. There are two types of slide systems. One is a gravity slide rail system equipped with a flotation device attached to the lower end of the slide. The other is a fixed slope slide rail system constructed at a fixed 20 to 22 percent grade.

Each LTF requires a log transfer area, a small float plane or boat dock, a barge off-loading ramp and a log raft storage area. These facilities generally are located close to the transfer facility.

The Forest Service has developed guidelines for LTF's, which are included in the Alaska Regional Guide, as well as adopted in the *Log Transfer Facility Sighting, Construction, Operation, and Monitoring/Reporting Guidelines*, developed by the Alaska Task Force (1985). The Environmental Protection Agency has adopted these guidelines as standard conditions for permits issued under provisions of the Clean Water Act.

Logging Camps

Logging camps house the work force that perform a harvest. A camp typically includes portable single family and group living units, a school, equipment repair shops, equipment storage area, a fuel transfer facility and fuel storage. The living units are often constructed on floats and anchored along the shoreline.

Currently there is one abandoned logging camp site and one active logging camp that could serve the Project Area. The abandoned camp is the larger of the two and is located in the Project Area between Labouchere Bay and Port Protection. This camp, if made active, could serve the

area south of Road 20 from Labouchere Bay to the Road 15 intersection near the El Capitan Passage. Access to the site is available by Road 20, float plane and boat.

The active logging camp is located outside the Project Area at Naukati, on the Tuxekan Narrows. This camp would serve the east side of the Project Area from Neck Lake north to the east side of Salmon Bay.

Logging Systems

Logging is the process of removing and transporting harvested trees. This process includes felling and bucking the trees into marketable lengths, yarding the logs to the transportation system, and loading the wood onto trucks. Yarding can be done by means of ground- based equipment, cable logging systems, or helicopters. The method used depends upon many factors including economics, access, topography, and resource protection requirements. The most commonly used methods of logging in Southeast Alaska are described below.

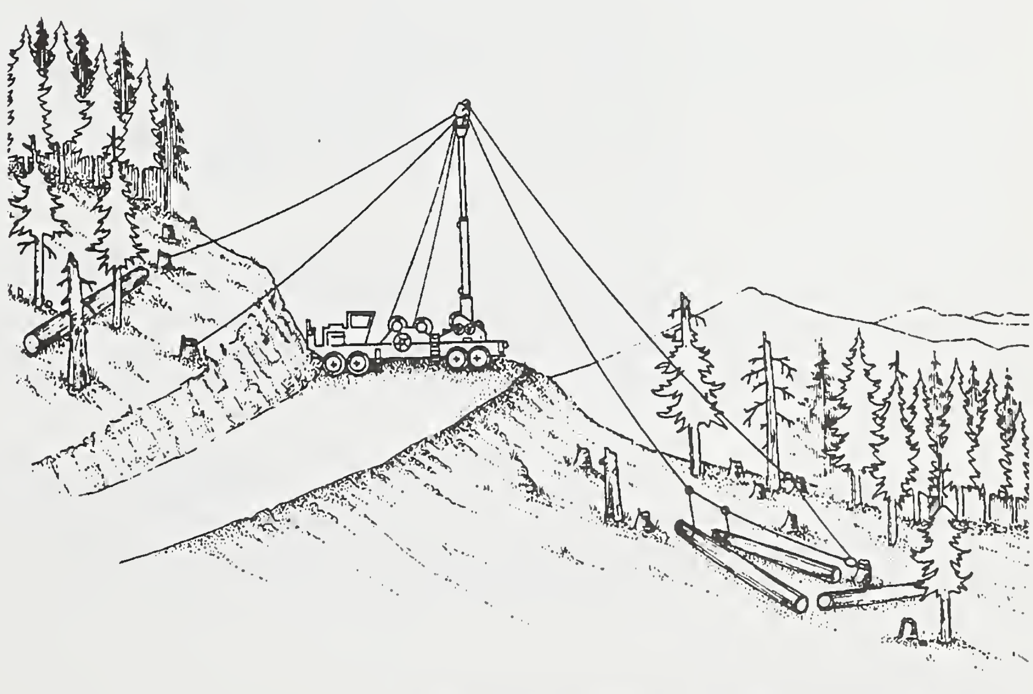
Shovel Logging

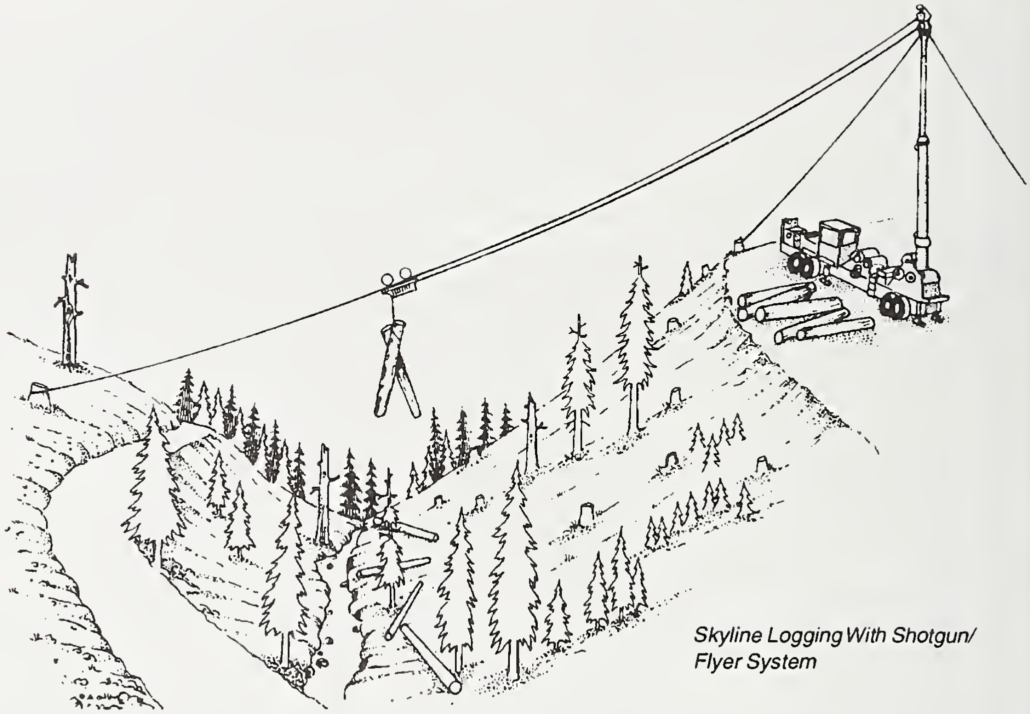
The moist organic soils in Southeast Alaska prohibit the use of rubber-tired and tracked skidders. Shovel logging with track mounted log loaders is the only ground-based system currently used in the Project Area. Shovel logging involves moving logs with the boom of a hydraulic log loader. The logs are repeatedly "swung" into piles and "leap frogged" to a road or landing. Due to soil compaction, shovel logging is only suitable for well-drained sites with slopes under 20 percent. Soil compaction can be further reduced when the shovel builds a debris mat of treetops and slash to "walk" on. Shovel logging is the most cost effective logging method currently used in the Lab Bay Project Area; however, the steep slopes and wet, organic soils limit the number of acres on which this system is feasible.

High Lead Logging

One of the two most common logging systems currently used in the Project Area is highlead cable logging. Logs yarded by highlead systems are generally dragged on the ground. Sometimes one end of the log is lifted by the 90-foot towers commonly used with this method. This system rarely gives partial or full suspension of logs. Where highlead logging is done uphill, the drag corridors radiate down and away from the landing. Water moving down the slope is dis-

Highlead or Cable Logging





Skyline Logging With Shotgun/ Flyer System

persed into the harvest unit. Where the highlead is directed down slope, water tends to congregate as the drag corridors converge at the landings.

Running Skyline Logging (with interlocking drums)

The other common method is the running skyline system with interlocking drums. These are generally mobile crane-like swing yarders with towers in the 50-60 foot range. These systems can be used for both uphill and downhill yarding. Partial suspension of logs occurs where topography allows. The system can be used with grapples for single log retrieval or chokers, for multiple small logs. This system is commonly used where multiple small landing locations are needed to prevent yarding across sensitive streams.

Skyline Systems - Live and Standing

With this system, a carriage is run on the skyline and is pulled to the yarder, giving partial or full suspension where topography allows. On "live" skyline systems, the skyline is on an active drum which can be raised and lowered. Standing skyline systems cannot be raised or lowered and the carriage used must have "slack pulling" capacity to access the logs. The live skyline can be used with both slack pulling and nonslack pulling carriages because the skyline can be lowered to access the logs.

The carriage is pulled out to the logs with the "haulback" line using the slack line system. This system is required for downhill logging. When uphill logging, the haulback line can be eliminated and gravity used to return the carriage to the logs. This is called the "flyer" or "shotgun" system. Many configurations of the slack line system are possible for both slack pulling and nonslack pulling carriages. The configurations are matched to the topography and timber conditions of each site.

The above systems require stronger guyline and tailhold anchors than the previously described cable systems. In scrubby muskeg-type timber, anchoring often must be done with artificial anchors such as rock bolts or "deadmen". Due to the higher cost of these logging systems and the requirements for very substantial anchors, these systems have been avoided in the past and are currently used very little.

Helicopter Logging

Although not historically used in the Lab Bay area, helicopter logging is a system used in other areas such as Coffman Cove and Thorne Bay. Helicopter logging costs are approximately twice that of the cable logging systems; however, this system can alleviate the need for costly road construction. Helicopter logging is typically used on stands of timber that economically cannot be accessed by a road. Helicopter logging allows partial cuts and group selection-type silvicultural harvesting which can be important in ecosystem management. The difference in costs of partial cutting versus clearcutting per unit of volume is much less than for any other system.

Logging Costs

Logging cost assigned to each setting was taken from the Forest Service's Timber Appraisal Handbook (24.09.22 R10) with the exception of helicopter logging which was derived from interviews with two helicopter logging companies with extensive experience on Prince of Wales Island (Planning Record).

These logging costs are based on clearcut logging and therefore were adjusted for the other methods used on the Lab Bay Project. Because partial cutting experience in Southeast Alaska has been limited, logging cost estimates are based on the expected percentage of clearcut logging production. Table 3-97 shows the logging cost used for each silvicultural prescription and each logging system.

Table 3-97

Harvest Cost Comparison by Silvicultural Prescription and Logging System ($/MBF)

Logging System	Silvicultural Prescription					
	A, B & D	C	E & F	G	H	I
Shovel (SH)	$108.69	$113.41	$115.49	$119.54	$137.55	$127.83
High-lead Uphill (UX)	$125.21	NA	NA	NA	NA	$161.15
High-lead Downhill (DX)	$141.74	NA	NA	NA	NA	$184.77
Running Skyline (RS)	$119.67	$134.10	$136.18	$144.94	$165.03	$144.39
Live Skyline (LS)	$120.76	$135.55	$137.63	$141.68	$166.85	$154.80
Slackline (SL)	$148.95	$166.57	$175.22	$179.26	$213.83	$195.07
Helicopter (HE)	$335.06	$332.45	$348.70	$353.77	$373.06	$364.16

Source: Timber Appraisal Handbook, USDA Forest Service

Operability

The suitable commercial timber production land in the Lab Bay Project Area has been divided into logical settings based on topographical maps, aerial photography, general knowledge of the area, and field inspections by logging engineers. These settings were assigned one of the logging systems described previously and also categorized as normal, difficult or isolated operability based on the following definitions:

Normal Operability

Physically suitable forestland with timber that could be harvested with commonly used equipment and logging systems such as highlead cable, skyline systems, and shovel. Cable systems have an external yarding distance of less than or equal to 2,000 feet and shovel yarding has an external yarding distance of less than or equal to 500 feet.

Difficult Operability

Physically suitable forestland with timber that only could be harvested by skyline systems with external yarding distances greater than 2,000 feet or by helicopter with flight paths less than one mile.

Isolated Operability

Small patches of physically suitable forestland with timber that could only be harvested by helicopters and involving log yarding distances; or areas that can be accessed by long segments of road that cannot be amortized by the volume harvested over the rotation. In this study, isolated operability included helicopter logging with flight paths over one mile and cable logging where more than one mile of road was required per one million board feet of timber.

Based on these categories, the current condition of the suitable land base in the Lab Bay Project Area which previously has not been harvested is shown in Table 3-98. In addition to the acres shown in Table 3-98 there is 26,531 acres of second growth that is classified as normal operability.

Table 3-98
Acres of Operability Class Suitable for Harvest

	Acres	Percent
Normal	33,425	70
Difficult	9,103	19
Isolated	5,071	11
Total	**47,599**	**100**

Source: Ketchikan Area GIS

Effects of the Alternatives

Transportation System

This section analyzes the effects of the proposed alternatives on the development and management of the Forest road system. The effects of each alternative on the transportation system are grouped according to the following categories: (1) construction and reconstruction costs, (2) road development, (3) access management, and (4) log transfer facilities. Additionally, the effects of LTF's on the marine benthic environment are discussed. The effects of the transportation system on other resources are considered in depth in the sections relating to those resources (soils, water, subsistence, recreation, fisheries and wildlife).

Proposed road development patterns are similar from one alternative to another due to the location of the resource being used, similar terrain characteristics and development costs. Roads would be located to minimize land disturbance while providing access to resources. Thus, road routes generally follow favorable terrain where practical.

Road Development and Road Classes

Each action alternative would require the expansion of the current road system in order to access harvest units. No roads would be constructed under Alternative 1 (Table 3-99).

Table 3-99
Miles of Existing and Proposed Roads by Alternative

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt 6
Proposed Roads						
Arterial	0.0	0.0	0.0	0.0	0.0	0.0
Collector	0.0	10.7	7.0	7.7	7.0	5.2
Local	0.0	56.5	40.8	33.6	43.8	20.2
Temporary	0.0	10.7	7.3	6.0	6.3	3.3
Total	**0.0**	**77.9**	**54.7**	**47.3**	**57.1**	**28.7**
Existing Roads*	370.6	370.6	370.6	370.6	370.6	370.6
Total Roads	**370.6**	**448.5**	**425.3**	**417.9**	**427.7**	**399.3**

Source: Ketchikan Area GIS

* Includes 2.6 miles (Alt. 5), 7.9 miles (Alt. 2) and 4.0 miles (Alt. 6) of road that need to be reconstructed.

Expansion of the road system would require construction of varying classes of roads (Collector, and Local); reconstruction of some existing roads; construction and reconstruction of major drainage structures; and timing construction to be compatible with fish and wildlife needs.

Construction

Two classes of road, Collector and Local, would be constructed as part of the action alternatives, each road class having different projected uses and construction standards. Collector roads generally are mainline system roads requiring higher construction standards and heavier investment to provide prolonged multiple use. These roads can be built to lower standards initially and upgraded as use increases. Thus the logging operator may construct Collector roads to low or medium standards depending upon expected use.

Local roads tend to be used intermittently, so can be constructed to a lower, less costly standard. These roads may have use restrictions during harvest activities that limit public access. Temporary roads, which are short-term roads for timber harvest activities only, were considered Local roads for analysis purposes since they are similar to Local roads.

All proposed road construction and reconstruction will be conducted to a standard safe for ongoing silvicultural activities. Road construction includes associated facilities such as logging landings, rock and borrow pits, and associated overburden disposal areas.

An expansion of the road network would occur in all but Alternative 1. Collector road construction under Alternatives 2 and 4 would develop the most miles (10.7and 7.7, respectively) while Alternative 6 would develop the fewest (5.2 miles). Local roads would be constructed in all action alternatives, ranging from 54.7 miles for Alternative 2 to 20.2 miles for Alternative 6. The level of Local road development is not directly proportional to the level of harvest in each alternative, because of differing spatial arrangements of the harvest units.

Harvest methods also influence the amount of road construction. For example, while Alternatives 4 and 6 includes the harvest of 218 acres on Thorne Island, no roads would be constructed because helicopter logging is proposed. All other action alternatives recommend the development of 16.3 miles of road on Thorne Island.

Reconstruction

Reconstruction of existing roads would be associated with all action alternatives. These activities would range from major culvert and bridge replacement to minor blading and shaping of the existing roads. Table 3-100 displays the number of bridges and major culverts expected to be required for each alternative.

The bridges recommended for all of the new and reconstructed roads are the temporary modular type. In addition, several stream crossings would require large culverts (over 48-inches-diameter). Large culvert and bridge costs are not factored into the general road construction costs shown below, but are itemized separately. The cost of large culverts and bridges is based on the following assumptions.

Because a modular bridge can be reused several times and a number are available on Prince of Wales Island, a cost of $50,000 was assigned to each modular bridge. This cost accounts for the installation and depreciation of the bridge. Large culverts were estimated to cost $4,500 each, a figure derived from the Forest Service Timber Appraisal Handbook (2409.22.R10) and based on an average size of 60 inches in diameter and 50 feet in length (Planning Record).

Table 3-100
Number of Bridges and Major Culverts by Alternative

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Construction/ Reconstruction						
Permanent	0	0	0	0	0	0
Modular	0	12	4	7	9	5
Major Culvert*	0	33	16	27	13	12

Source: Lab Bay Planning Record

* Major culvert is defined as one greater than 48 inches in diameter.

Construction and Reconstruction Costs

Field verification identified and rated the difficulty of roads proposed to be constructed. Road segments were categorized into low, medium, and high difficulty based on a combination of average slope, the amount of rock blasting required, and the type of road (Collector or Local). Construction costs for the Lab Bay Project Area are based on cost data for 60 miles of similar road constructed during 1991 that ranged from $110,000 to $300,000 per mile. Costs per mile estimates used for low, medium, and high construction difficulty are $120,000, $160,000 and $220,000 respectively. Analysis of all road segments combined resulted in an average construction cost per mile of $163,500 (in 1992 dollars).

The estimated cost to develop the road network needed to support each alternative is summarized in Table 3-101. Alternative 2 contains the highest level of development, and has the highest costs. Alternative 6 contains the lowest level of development and the lowest cost.

Table 3-101
Transportation Network by Alternative, by Miles and Costs

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Miles New Construction	0	77.9	54.7	47.3	57.1	28.7
Total Construction (M$)	0	$13,129	$9,125	$8,051	$9,824	$4,801
Miles Heavy Reconstruction	0	7.0	2.8	4.0	1.1	0.3
Total Reconstruction(M$)	0	$135	$57	$79	$27	$13
Bridge/Culvert Construction Cost ($M)						
Permanent	0	0	0	0	0	0
Modular	0	$480	$180	$310	$350	$230
Major Culvert	0	$150	$72	$122	$60	$54
Total Bridge Cost ($M)	0	$630	$252	$432	$410	$284
Total Construction and Reconstruction Costs (M$)	0	$13,894	$9,434	$8,562	$10,261	$5,098

Source: Lab Bay Planning Record

M = Thousands of Dollars

Calder Tie Road

During the public scoping process, development of the Calder Tie Road was identified as a key issue associated with activities proposed in the Lab Bay area. The Calder Tie Road would connect Road 29 near Labouchere Bay with Road 29 near Calder Bay, shortening the travel time between the Lab Bay Camp area and the Calder Bay grouping of units from approximately 2.5 hours to 1 hour. If the Lab Bay Camp reopened, this would allow logging crews from Lab Bay to operate in the Calder Bay area and would eliminate the need for a floating camp. The tie road also would allow heavy equipment to be transported between these sites. Currently, all equipment is barged to Calder Bay because of inadequate road access. The tie road would allow more diversified logging equipment to be used in the Calder Bay area. Funding for this road possibly could come from interested private parties rather than Forest Service operating funds.

The length of road necessary to link the Calder Bay portion of Road 29 to the Lab Bay segment varies by alternative. The reason for the variation is that Unit 528-250, included only in Alternatives 2, 3, 5, and 6, uses a portion of this link for access. Table 3-102 presents the length and cost of the tie road by alternative.

Effects of the Calder Tie Road on socio-economics, subsistence use and recreation are addressed in those sections of this document.

As proposed in the TLMP Draft Revision (1991a), the Desired Future Condition (DFC) in the year 2054 includes all but 0.20 mile of the Calder Tie Road as part of the forest transportation road system. This 0.20-mile segment would be the only portion not used for timber transportation in the long term if the DFC is achieved.

Table 3-102
Length and Construction Cost of the Calder Tie Road

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Miles of Construction	0	0.8	0.8	1.2	0.8	0.8
Construction Cost (M$)	0	$128	$128	$189	$128	$0*

Source: Lab Bay Planning Record

* Calder Tie Road not proposed under Alternative 6

Coordination of Road Construction with Fish and Wildlife

Development in some areas may require road construction or reconstruction near inventoried eagle nest trees, although no road construction is anticipated within 330 feet of any known nest tree. This is standard sighting practice unless terrain or physical requirements such as road grade prevent avoidance. However, timing restrictions are required for any blasting that would occur within one-half mile of a bald eagle nest. A list of proposed roads and associated units that may be affected are displayed in Table 3-89.

Timing restrictions would also be implemented for any active goshawk nests identified within the Project Area. No prolonged mechanical activity (including drilling and blasting) would be allowed within 600 feet of an active goshawk nest area from March 15 to September 1. Activity restrictions are removed after June 30 for nests that become inactive or unsuccessful.

Road building within 0.5 mile of occupied trumpeter swan habitat and within 410 feet of occupied goose habitat would not be permitted during critical periods of the year (nesting, brood rearing, molting and wintering).

For known active wolf denning sites, implementation of disturbance timing restrictions extending from February 1 to July 30 have been suggested for management activities occurring within one-half mile of the den (Confer and Hall 1994).

New roads would span some streams identified as important salmonid habitat. Construction of stream crossings would be scheduled during months considered least critical to sensitive life stages of the fish which are present. Generally, these restrictions can be accommodated through planning and scheduling of the construction activities.. In some cases, however, further costs may be incurred for additional equipment mobilization and demobilization, and protective measures during construction. The number of crossings influenced by these fisheries restrictions are displayed in Tables 3-41 and 3-103.

Table 3-103
Number of Crossings with Construction Timing Restrictions for Fish

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Timing	0	28	12	17	20	9

Source: Lab Bay Planning Record

VCU - specific locations for fish timing sites are located in Unit Design Cards and Maps (Planning Record).

Table 3-104 displays roads and harvest units that would be affected by more than one resource timing restriction. For these road and/or units, it may be necessary to conduct multiseason road

construction and harvest. The restriction period displayed for fish is a combination of coho, pink and chum, sockeye, and steelhead restrictions. Streams with these timing restrictions would be surveyed prior to implementation to determine species use. The District Fish and Wildlife Biologist would be consulted during the year of activity to determine final timing restrictions, based on use of the area by the species of concern, and to determine if waivers or variances are necessary.

For roads and/or units with the potential for a limited or nonexistent construction or harvest window, the purchaser may request a timing restriction waiver. The Thorne Bay Ranger District has developed several options to increase the length of the construction window, based on previous project experience. These include installation of a log stringer bridge, which allows equipment across a creek without any instream construction; on small, nonfish bearing streams, dam and divert water around the site during culvert placement and rocking; install culverts or bridges during low flow periods or when streams are frozen. Consultation with the District Fish and Wildlife Biologist would be necessary to determine appropriate options for each site.

Table 3-104

Units and Roads with Multiple Timing Restrictions

Affected Road	Affected Unit(s)	Mitigation[1] Measures	Restriction Period[2]
64-76-10.1	529-285	F8	August 16 thru July 17
		W7	October 1 thru April 30
65-77-10	529-212, -214, -215, -218, 529-220, 531.1-220, -221, -230	F8	August 16 thru July 17
		W7	October 1 thru April 30
65-80-31	539-220, -212	F8	August 16 thru July 17
		W7	October 1 thru April 30
66-80-05	539-222	F8	August 16 thru July 17
		W7	October 1 thru April 30
66-80-04	540-206, -210	F8	August 16 thru July 17
		W4	March 1 thru August 31
66-80-28	551-216, -219	W4	March 1 thru August 31
		W8	February 1 thru July 31
2931[3]	531.1-257,-205, -208, -213	F8	August 16 thru July 17
		W7	October 1 thru April 30
	529-286	W4	March 1 thru August 31
		W7	October 1 thru April 30
	551-224	W7	April 20 thru August 31
		W8	February 1 thru July 31

Source: Ketchikan Area GIS

1 Refer to the Mitigation Section in Chapter 2 for a description of mitigation measures

2 Restriction periods assume maximum time period. Management restrictions vary by mitigation measure

3 Existing road proposed for reconstruction

Proposed Logging Systems

The logging systems proposed for the action alternatives were selected from systems used in the Lab Bay Project Area. Selections were based on site inspections and critical profile analyses to

determine the most efficient system while still meeting Forest standards and guidelines. The majority of the settings proposed for harvest are designed to achieve at least partial suspension of the logs while yarding, resulting in a significantly higher percentage of skyline systems than historically (prior to 1989) used in the Project Area. This is due to the increased stream and soil protection and the increased partial cutting which these systems allow and which is required by TLMP.

Shovel logging is being used more frequently in Southeast Alaska due to its efficiency. No shovel logging is currently proposed; however, there may be opportunities to use this system. Small portions of cable settings potentially could be suited to shovel logging. This determination would be made during the final layout.

Helicopter logging is specified in each action alternative. This system was selected for Thorne Island under Alternatives 4 and 6 and elsewhere that conventional logging systems were not feasible. None of the helicopter settings require additional road construction; however, several of these settings are dependent on other units being harvested in order to provide adequate landing sites. Table 3-105A displays the number of units proposed for helicopter logging in each alternative.

Table 3-105A
Number of Helicopter Units Proposed for Harvest

Alternative	Complete Units	Partial Units*	Thorne Island Uneven-Aged Mgt. Plan
2	22	3	no
3	10	1	no
4	13	1	yes
5	15	2	no
6	6	1	yes

Source: Ketchikan Area GIS

* Units with a mix of helicopter and cable yarding are: (1) 531.1-205, one helicopter setting; (2) 533-222, one helicopter setting; and (3) 536-217, two helicopter settings.

Thorne Island would be harvested in patches averaging 2 acres under Alternative 4 and 6, and the logs would be removed by helicopter. Two options are available to process the logs. First, the logs could be dropped onto barges positioned at various locations along the shoreline. Logs would be limbed, banded into bundles, and the bundles dropped into the water to form small rafts. Slash would be accumulated in nets on the barges and periodically removed by helicopter for land disposal. The rafts would be towed to a storage or processing location. The second handling option would be to drop the logs directly inside of log booms anchored in the water. Prior to rafting and towing, the logs would be temporarily removed from the water for processing and bundling, and then returned to the water. The first option would be the most costly because of the length of time the barges would be in use. While the second option would be less costly, it would pose a much higher risk of log loss from sinking or breaking free of the log booms.

Table 3-105B displays the distribution of proposed yarding systems for the action alternatives.

Table 3-105B

Proposed Logging System by Alternative in Percent of Proposed Harvest Volume

Alternative	Highlead	Running Skyline (Interlocking Drums)	Live Skyline (Shotgun)	Slackline	Shovel	Helicopter
2	3%	51%	15%	16%	0%	15%
3	4%	50%	20%	14%	0%	12%
4	5%	42%	16%	15%	0%	22%
5	2%	56%	18%	11%	0%	13%
6	2%	47%	18%	9%	0%	24%

Source: Ketchikan Area GIS

The acres harvested from each operability class (Normal, Difficult, and Isolated) are shown in Table 3-106.

Table 3-106

Normal, Difficult and Isolated Acre Projections by Alternative

	Existing Acres	Alt. 2 Acres	Alt. 3 Acres	Alt. 4 Acres	Alt. 5 Acres	Alt. 6 Acres
Normal	33,425	3,739	2,635	2,191	2,639	1,403
Difficult	9,103	811	405	728	467	482
Isolated	5,071	0	0	0	0	0

Source: Ketchikan Area GIS

Alternative 6 has the highest percentage of difficult and isolated acres, while Alternative 3 has the lowest.

Log Transfer Facilities (LTF'S)

Log Transfer Facilities (LTF's) presently operating in the project vicinity would be used to transport the timber scheduled to be harvested under the action alternatives. Alternative 4 and 6 would use the existing LTF's, while an additional LTF would be needed for Alternatives 2, 3, and 5. It is proposed for construction on the west side of Thorne Island. Approval of LTF sites is based on site evaluations and a comparison of the results with both the Alaska Timber Task Force siting guidelines and with the results on other potential sites nearby. The National Marine Fisheries Service (NMFS) investigated other potential LTF sites on Thorne Island in 1976. Reconnaissance studies included site evaluations by transportation planning specialists and an intertidal/subtidal survey by the U.S. Fish and Wildlife Service and NMFS (NMFS 1992, and Rhodes, Landrum, and Guhl 1991). Table 3-107 compares the characteristics of the recommended site to the Alaska Timber Task Force LTF siting guidelines (Alaska Timber Task Force 1985). Detailed site analysis reports are included in the Planning Record.

The Lab Bay Calder Bay, and Whale Pass LTF's were constructed prior to the development of the Alaska Timber Task Force guidelines and the issuing of National Pollution Discharge Elimination System (NPDES) permits for individual LTF's. These sites are covered by a general NPDES permit for older LTF's in the Ketchikan Area. The NPDES permit expires on September 9, 1997 and contains no monitoring requirements. New LTF's are issued individual NPDES permits that

may contain monitoring requirements for each site. Alternative methods of log transfer are not discussed in this EIS for the Lab Bay, Calder Bay, and the Whale Pass sites since there is an existing permit for the operation of these LTF's.

Table 3-107

Comparison of Conditions at Proposed Thorne Island LTF to Alaska Timber Task Force LTF Siting Guidelines

Criteria	ATTF Siting Guidelines	Thorne Island Site
Proximity to Rearing and Spawning Areas	Siting of log transfer and log storage facilities within 300 feet of the mouths of anadromous fish streams, or in areas known to be important for fish spawning or rearing, is normally prohibited.	Nearest anadromous stream some 1.25 miles away; shoreline distance 0.8 mile away (direct line).
Protected Locations	Log transfer and log raft storage facilities should be sited in weather-protected waters with bottoms suitable for anchoring and, with at least 20 acres for temporary log storage and log booming.	While not located in an embayment, location between Prince of Wales Island and Thorne Island provides adequate protection.
Upland Facility Requirements	Log transfer facilities generally should be sited in proximity to at least five acres of relatively flat uplands. There should also be a body of water sufficient to provide a minimum of 60 lineal feet of facility face.	The operating face on the water exceeds 60 feet. There are several acres of moderately flat land some 0.25 miles south of the site. Unit 551-227 upslope of the site slopes steeply to the south end.
Safe Access to a Facility from the Uplands	To provide safe access to the log transfer facility and adjoining log sort yard, the facility should be sited where access roads can maintain a grade of 10 percent or less for trucks and 4 percent or less for specialized equipment.	Proposed access road has a grade of approximately 6 percent for more than 0.25 mile.
Bark Dispersal	Log transfer facilities should be sited along or adjacent to straits and channels or deep bays where currents may be strong enough to disperse sunken or floating wood debris. Siting log transfer facilities in embayments with sills or other natural restrictions to tidal exchange should be avoided.	Slope and depth are less than of guidelines, reaching a depth of only about 40 feet at a distance 330 feet offshore. Cobble silt substrate indicates low current velocity and probable limited debris dispersal (NMFS 1992).
Site Productivity	Site for in-water storage and/or transfer of logs should be located in areas having the least productive intertidal and subtidal zones.	Site reported to be of low productivity, based on results of dive survey (NMFS 1992).
Sensitive Habitat	Log transfer facilities and log raft storage areas should not be sited on or adjacent to (i.e., near enough to effect) extensive tideflats, salt marshes, kelp or eelgrass beds, seaweed harvest areas or shellfish concentration areas.	Proposed site will not affect any known sensitive habitat. No eelgrass or kelp observed during NMFS 1992 survey or during resource specialists site evaluation.

Table 3-107 (Continued)

Comparison of Conditions at Proposed Thorne Island LTF to Alaska Timber Task Force LTF Siting Guidelines

Criteria	ATTF Sighting Guidelines	Thorne Island Site
Safe Marine Access to Facilities	Log rafting and storage facilities should be safely accessible to tug boats with log rafts at most tides on most winter days.	Whale Passage is wide enough and deep enough to afford safe passage of tugs and log rafts. Whale Passage provides protection from the weather.
Storage and Rafting	Logs, log bundles, and log rafts should be stored in areas where they will not ground at low tide. A minimum depth of 40 feet (12 meters) or deeper, measured at mean lower low water, for log raft storage is preferred.	Whale Passage is large enough and deep enough to provide sufficient space for rafting and storage of logs. Grounding of logs would only occur if storage were close to shore where depths are less than ideal.
Avoid Bald Eagle Nests	Site log transfer facilities to avoid bald eagle nests. No project construction or operation should be closer than 330 feet to known eagle nest trees.	Nearest eagle nest located approximately 1.5 to the north of proposed LTF site.

Source: Alaska Timber Task Force; U.S. Fish and Wildlife Service; National Marine Fisheries Service.

The West Thorne Island LTF site is recommended based on the following findings:

- Excellent deep water rafting area adjacent to the site;
- Rafting area is in a protected location (Whale Pass);
- Beach characteristics will accommodate a minimum footprint, low-angle slide;
- Whale Passage previously affected by log raft movements;
- Site offers protected area for docking commuter boats; and
- Site has low biological productivity based on intertidal survey.

In its review of the West Thorne Island site, the National Marine Fisheries Service concluded that it does not meet the Alaska Timber Task Force siting guidelines for water depth or potential bark accumulation. However, because the site is low in overall productivity, NMFS did not have an objection to the construction and operation of an LTF at this location (NMFS 1992).

The amount of use each existing and proposed LTF would receive varies by alternative based on the difference in distribution of the harvest units (Table 3-108).

Table 3-108
Estimated Volume of Timber to be Transferred by Each LTF (in MMBF)

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Labouchere Bay	0	67,926	42,368	41,814	45,940	27,015
Calder Bay	0	8,172	2,769	2,769	3,840	0
Whale Passage	0	13,605	8,999	13,605	7,936	9,493
Thorne Island	0	11,619	11,619	3,557[1]	11,619	3,557[1]
Total	**0**	**101,322**	**65,755**	**61,745**	**69,335**	**40,065**

Source: Lab Bay Planning Record

[1] An LTF is not constructed on Thorne Island under this alternative. This volume is helicopter yarded to barges, then towed to the Thorne Bay sort yard.

Logging Camps

Existing logging camp sites in the vicinity would be required to support the timber harvest scheduled in the action alternatives. The Lab Bay and Calder Bay sites would not be needed if Alternative 1 were adopted. The Naukati logging camp is the nearest active camp to the Project Area. This camp is not as dependent on the timber from the Lab Bay Project Area because it services other areas. Implementation of an action alternative would affect Naukati Camp as shown in Table 3-109 below.

Table 3-109
Estimated Volume of Timber to be Serviced by Logging Camp Sites (in MMBF)

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Labouchere Bay*	0	67.9	42.4	41.8	45.9	27.0
Calder Bay*	0	8.2	2.8	2.8	3.8	0
Naukati	0	25.2	20.6	17.1	19.6	13.0

Source: Lab Bay Planning Record

* Timber from Calder Bay could be serviced by the Lab Bay Camp if the Calder Bay Tie Road eliminated the need for the Calder Bay logging camp.

Cumulative Effects

Transportation

The Desired Future Condition of the Lab Bay Project Area includes a complete transportation system which accesses all of the commercial forest lands as well as certain communities and recreation sites. While the road development required to support each action alternative is consistent with this management objective, implementation would induce a number of cumulative effects. These could include reduction in timber production lands and associated vegetation communities; formation of rock pits; alterations to fish and wildlife habitat; visual disturbance; altered subsistence patterns; and changes in recreational use areas. These potential effects are described in other sections of this EIS.

The estimated acreage of land that would be taken out of production by volume class is summarized in Table 3-110.

Table 3-110
Acres of Land Out of Production from Road Construction (by Volume Class)

	Existing Roads	Proposed Roads Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
VC <4	2651.2	232.5	175.5	154.9	192.7	84.4
VC 4-7	705.5	497.5	333.6	291.5	354.6	176.1
Total Acres	**3356.7**	**730.0**	**509.1**	**446.4**	**547.3**	**260.5**

Source: Ketchikan Area GIS

Desired Future Condition of Transportation System

None of the harvest activities proposed through the year 2054 are projected to be in second growth timber; therefore, the road system would need to be expanded for each harvest. After 2054, timber harvests from the Lab Bay Project Area would occur mainly in second growth stands and the existing road network would be used. This network would require reconstruction, improvement, and maintenance throughout the period of use.

The projected future condition of the Lab Bay Project Area road system is shown in Table 3-111. The future condition reflects the miles of road developed to access all of the timber in the Project Area. This is assumed to occur by the year 2054. This project is assumed to be implemented by the year 2004.

Table 3-111
Future Condition of Project Area Roads

	Present	2004	2054
Miles of Road			
MA K01	155.40	196.50	318.00
MA K02	0.04	0.04	0.04
MA K03	215.40	252.20	356.00

Source: Ketchikan Area GIS

Road Construction Within Stream Buffer Areas

Roads would be constructed in stream buffer areas only where necessary due to topography, geology or transportation safety considerations. When final road locations are laid out on the ground, care will be taken to keep as much of the road outside the stream buffer as possible. In most cases, the limiting factor will be the type of terrain adjacent to the buffered stream which will govern how much of a given road segment can be located beyond the buffer. This design approach is consistent with the Tongass Timber Reform Act (TTRA). For a discussion of stream buffers, see Floodplains, Wetlands & Riparian Areas in this chapter; Chapter 2, Mitigation Measures.

Rock Quarries

Rock quarries are needed when constructing roads in the Lab Bay Project Area. Rock would be obtained by expanding existing pits and developing new ones. Generally rock quarries are located every 1 to 2 miles along roads. The quarry location is determined by quality rock sources, haul distances, development costs, frequency of entry and visual resources considerations. An allowance for rock quarries is included in the acres shown for road right-of-way clearing (see Soils in this chapter). It is estimated that any of the action alternatives would require 15-25 acres of land to be taken out of production for this purpose.

Some rock quarries are small and would involve one-time uses, while others would be expanded during future road building operations if quality rock is available. Rock quarries with expansion potential would be retained for expansion, particularly in situations where potential roads and timber harvest may be developed in the future, or where numerous roads radiate out from a point near a centralized quarry. Rock quarries near the ends of the road system would be closed and reclaimed by spreading stockpiled overburden on the floor of the quarry.

Each quarry would be evaluated during the construction stage for the following: (1) availability of additional quality rock, (2) feasibility of expansion, (3) future rock resource needs in the area, and (4) other natural resource objectives.

Log Transfer Facilities

Effects of LTF's on Marine Benthic Environment

During the transfer of logs from land to water, bark is sloughed off and may be deposited on the ocean bottom; bark also is continually sloughed off from agitation by wind and waves while the logs are in rafts. If the bark accumulates on the bottom, it can diminish habitat for bottom-dwelling crustaceans and mollusks, as well as hamper underwater vegetation used as food and rearing sites for marine fish and other organisms. The existing facilities in the Project Area have been designed to maximize flushing of suspended bark away from the LTF area to the open sea before it can accumulate on the bottom. In 1985 it was determined that discharge of bark into the water at an LTF required a National Pollution Discharge Elimination System (NPDES) permit.

Log transfer facilities will affect the marine benthic habitat (plants and animals that live in and on the bottom). Marine benthic habitat effects are expected to be as follows:

1. Structural Embankment: Estimated 0.23 acres affected per site.
2. Site Bark Deposition: Estimated 1.96 acres affected per site.
3. Raft Storage Bark Deposition: Unknown.

Structural Embankment

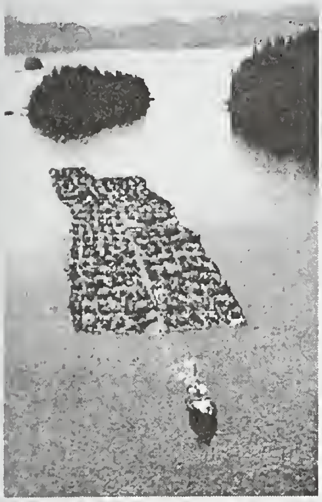
All LTF-types occupy approximately the same amount of bottom area. For instance, the float off-push in a 10 percent grade system extends approximately 250 feet out into the water on a moderately sloped beach. This system is thus long and narrow. The slide and A-frame systems use more shoreline, and do not protrude out into the water as much as the float off-push system. All systems, therefore, cover about the same bottom area, but in different configurations.

Site Bark Deposition

Two publications describe some of the general effects of log transfer facilities and log storage on the marine benthic habitat. Sedell and Duvall (1985) summarize the information available on the effects log transport and storage have on marine resources and fisheries. Faris and Vaughn (1985) examined log transportation and log storage in Southeast Alaska.

Shultz and Berg (1976) examined 32 existing log transfer facility sites and found that 19 had bark accumulation, 8 had no bark accumulation, and 5 had traces of bark. The extent of bark accumulation ranged from 0 to 9.0 acres for 31 of the 32 sites. The 32nd site had accumulation of 182 acres that could not solely be attributed to log transfer activities. Faris and Vaughn (1985) reexamined the original data from Shultz and Berg (1976) and found that the average accumulation size was 1.96 acres for all sites excluding the 182-acre site. They speculate that bark and

debris accumulation may be decreasing over time due to currents. No estimate was made on the length of time before bark accumulation was completely eliminated.



Faris and Vaughn (1976) also examined the extent of total damage to the marine benthic habitat in Southeast Alaska. Their results indicate that from the 90 currently permitted sites, a total of 176 acres would be affected (using the 1.96 acre average). This is 0.2 percent of the total estuarine area that is less than 60 feet deep within the permitted sites. Moreover, when they examined all of the potential area of bark and debris accumulation from all permitted and proposed sites in Southeast Alaska, including all sites considered in the KPC Long-term Sale 1989-1994 EIS, they found that a total of 317 acres would be affected. This is 0.09 percent of the total estuarine area that is less than 60 feet deep in all of Southeast Alaska. This result corresponds with the conclusions of Sedell and Duvall (1985) that the evidence of damage on important marine populations (bivalves, crabs and salmonoids) was inconclusive because of the small area of impact due to log transfer facilities. This evidence resulted in development of the current sighting guidelines - e.g., avoiding crab habitat, shallow areas at the heads of bay, etc. - and suggests that impacts would be minimal.

The major effect of bark and debris accumulation is that little neck clams and bay mussels have been shown to be eliminated when as little as 4 to 5 inches of bark accumulates (Freese and O'Clair 1987). Further, Conlan and Ellis (1979) reported mollusks and several polychaetes were excluded by bark debris thicker than 2.5 cm., and the effects of bark may last several decades. From this evidence, it can be assumed that other plants and animals that live in and on the bottom would probably be at a similar risk.

Toxic substances leaching from bark can settle out in saltwater; therefore, these substances do not appear to be a major problem in open water where good circulation exists (Sedell and Duval 1985).

Certain dissolved substances (hydrogen sulfide and ammonia) have been shown to occur in open spaces between pieces of bark accumulated on the bottom (O'Clair and Freese 1988). O'Clair and Freese also note that it is not clear whether other toxic substances not measured in the study occur within bark accumulations. These substances do not enter the water above the bark; however, if dungeness crabs burrow into the bark deposit, it has been demonstrated that their reproductive ability, eating habits, and overall survival can be affected. It should be noted that this type of effect has been demonstrated in only one bark accumulation field (Rowan Bay log transfer facility) and that, in general, dungeness crabs were not found in bark accumulations at other transfer facilities. It is not known whether these effects would occur for other burrowing crab species. Although king crabs do not burrow, it is not clear whether this species is affected by bark and debris accumulation at log transfer facility sites.

The proposed Thorne Island LTF site was reported to be of low productivity and was not found to support a diverse invertebrate fauna. Species diversity was low, with barnacles (*Balanus* spp.) and mussels (*Mytilus edulis*) being the most abundant. No species of special interest or concern (crabs) were noted (NMFS 1992).

Table 3-112 displays the effects of bark deposition associated with the proposed alternatives.

Table 3-112
LTF-Associated Bark Deposition

LTF Site	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Existing						
Calder Bay	SR	CI	CI	CI	CI	SR
Lab Bay	SR	CI	CI	CI	CI	CI
Whale Passage	SR	CI	CI	CI	CI	CI
Proposed						
Thorne Island	0	NI	NI	0	NI	0
		1.96 ac	1.96 ac		1.96 ac	

Source: Lab Bay Planning Record

SR = Short-term Recovery; CI = Continuing Impact; NI = New Impact

Raft Storage Bark Deposition

The other potential effects associated with log transfer facilities are from log rafts and log storage in saltwater. The area under a log raft may be affected by bark accumulations with effects similar to but not as concentrated as those discussed for log transfer facilities. In addition, if the raft is stored in a bay or cove for a long period of time, marine algae may be affected by shading. Occasionally, rafts stored in shallow depths may ground on the bottom. This would cause mechanical disruption or compaction of inter- and subtidal bottom habitats. This would be a short-duration effect because recolonization would begin shortly after the raft refloated, unless the site were repeatedly used and log rafts frequently grounded. Proposed and existing log storage areas in the Project Area are deep enough and are not expected to ground.

Assuming the average disturbance area for each LTF site is 1.96 acres, the total effects by alternative would be as shown below in Table 3-113. Numbers are based on proposed use of the three existing LTF's for Alternatives 2, 3, 4, and 5. Only two existing LTF's would be used for Alternative 6. Construction of a new LTF on Thorne Island is included under Alternatives 2, 3 and 5.

Table 3-113
Impacts of Bark Deposition by Alternative

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Acres	0	7.8	7.8	5.9	7.8	3.9

Source: Lab Bay Planning Record

When LTF's are abandoned, bark deposition diminishes at highly variable, but relatively slow rates (Faris and Vaughan 1985). Schultz and Berg (1976) compared fifteen active sites with sixteen sites that had been inactive for periods of 10 to 16 years and found the average bark accumulation at the former to be 2.8 acres and at the latter only 1-2 acres, suggesting some decrease over time. Mechanisms responsible for this decrease could include: 1) flushing actions of local currents; 2) burial in sediments deposited in area; and 3) decay. None of these mechanisms are likely to be pronounced at any of the existing LTF's nor at the proposed new Thorne Island LTF. Therefore, the effects of bark deposition are likely to persist over the reasonably

foreseeable future at all sites. Less deposition is anticipated at the Thorne Island site because it would handle less timber volume over a shorter duration.

Management Of Road System

Post-harvest Maintenance

Roads constructed for the Lab Bay project are all for ongoing silvicultural activities. However, incidental use for other activities can be expected on those roads that are open to public access. Maintenance levels are based on anticipated road use. The maintenance levels also incorporate traffic service levels and access management. Traffic service levels are displayed in Appendix I. Applicable maintenance levels for the Project Area are:

- Maintenance Level 1 (Traffic Service Level D) - Roads are closed by bridge removal or organic encroachment and are monitored for resource protection. Basic custodial maintenance is performed to perpetuate the road and to facilitate future management activities.
- Maintenance Level 2 (Traffic Service Level C) - Roads are maintained for high-clearance vehicles and monitored for resource protection. Traffic is normally minor, usually consisting of ongoing administrative or incidental recreational uses.
- Maintenance Level 3 (Traffic Service Level B) - Roads are maintained for travel by a prudent driver in a standard passenger vehicle and are subject to the provisions of the Highway Safety Act. Road use is by administrative and passenger vehicles, and logging trucks.

Access Management

Access Management Option B as presented in the 1989-94 EIS (USDA Forest Service 1989), represents the current Access Management Plan for the Lab Bay Project Area. Post-harvest access management of forest roads is used where necessary to control any class or type of traffic. Use is managed to prevent damage to the roadway, and to meet management direction for wildlife and recreational objectives. Access might be encouraged, accepted, discouraged, eliminated, prohibited, or prohibited seasonally. Access into newly entered drainages would be discouraged or prohibited to minimize wildlife impacts unless there is a specific recreational opportunity. Roads are closed for several reasons, including fish and wildlife protection, public safety, and inadequate maintenance funding. Roads under Forest Service jurisdiction can be closed by authority of CFR 36, Chapter 11, Parts 212.7 and 261. Road closure orders would be posted at the Thorne Bay Ranger District Office. Because United States mining laws confer a statutory right to enter public lands to search for minerals, access to mining claims would not be restricted; however, miners and prospectors would be required to obtain a permit to use restricted roads.

The access management categories used for Lab Bay Project roads are summarized below. Appendix I presents the proposed access management for each road segment.

- Encourage - Motor vehicle use is encouraged by appropriate signing, public notification, and active maintenance of the road prism.
- Accept - Motor vehicle use is allowed but not encouraged, while the road is maintained for administrative access.
- Discourage - Motor vehicle use is discouraged by allowing alder growth at road entrance, nonremoval of blowdown, or road prism deterioration within acceptable environmental limits (depending on designated maintenance level). To discourage use, the road may also be signed as "Not Maintained for Motor Vehicle Traffic."
- Eliminate - Motor vehicle use is eliminated by physically blocking the road. Where prescribed for long-term intermittent roads, this strategy is achieved by placement of impassable barricades at road entrances. On short-term roads, removal of drainage structures effectively blocks vehicle traffic.
- Prohibit - Motor vehicle use is prohibited by a road order (i.e., CFR closure). Implementation of this strategy on remote road systems may require the installation of gates, in addition to pubic notification and appropriate signing.

- Prohibit Seasonally - A road is closed to motor vehicle use at times during the normal operating year. For all alternatives, seasonal prohibitions will be used as necessary to mitigate impacts to wildlife and subsistence resources (e.g., closure during either-sex deer hunting season). Administrative and permitted use of the roads will continue during closure periods, but only for specific permitted uses. Seasonal closures may be used in combination with cooperative efforts with fish and game protective agencies.

Road Closures

Roads closed by the Access Management plan will be by gate, earth barrier (tank trap), rock barrier, or vegetation. Access will be managed according to the individual road management objectives. Currently closed roads and roads proposed for closure are displayed in Table 3-114 and on the oversize color map. Reasons for proposing closures are discussed on the Road Management Objectives cards (Appendix I).

A seasonal road closure is proposed for Road 15, at a point east of the Forest Service work camp at El Cap. A gate will be used to prohibit access to the camp and El Cap Cave during the winter months. Private landowners in the area will be provided access through the gate.

Table 3-114
Miles of Road by Alternative

	Alternatives					
	1	2	3	4	5	6
Miles of New Road	0	78	55	47	57	29
Miles of Road to be Closed	0	75	52	44	54	26
Miles of New Road Remaining Open	0	3	3	3	3	3
Miles of Existing Open Road*	310	310	310	310	310	310
Miles of Existing Road to be Closed	0	54	54	54	54	54
Miles of Existing Road to Remain Open	310	259	259	259	259	259

Source: Ketchikan Area GIS

* Includes existing open roads to be reconstructed

Monitoring

The Forest Plan recognizes three distinct types of monitoring: implementation, effectiveness, and validation. Implementation monitoring determines if projects and activities comply with Forest Plan standards and guidelines. Effectiveness monitoring determines whether the standards and guidelines achieve the desired results. Validation monitoring determines whether the assumptions in the Forest Plan regarding the relationship between management actions and their effects are correct, or if there is a better way to depict these relationships.

A monitoring plan has been developed for the Tongass National Forest by the Forest Planning Team and is described in the TLMP Draft Revision (1991a). The Lab Bay Project Area would contribute towards meeting overall Forest Plan monitoring goals through the selection of proposed harvest units/roads for monitoring. Recommendations for monitoring in the Lab Bay Project Area have been documented in the project planning record.

Project-specific monitoring that is unique to the Lab Bay Project Area, and that would not be included in regular Forest Plan or routine implementation monitoring, has been identified for several resources. Project-specific monitoring is not identified for logging, transportation, or facilities.

Socio-Economic Environment

Labouchere Bay Logging Camp, 1991.

Key Terms

Direct Effects for Employment and Income - Those effects that impact sectors either exporting goods and services from the primary zone of influence or selling those products to final consumers within the zone. An example of direct employment would be people working in a sawmill.

Discounted Benefits - The sum of the stream of all benefits derived from the Forest over the life of a project, discounted to the present.

Discounted Costs - The sum of the stream of all costs derived from the Forest over the life of a project, discounted to the present.

Economic Efficiency - A measure of the relationship between discounted costs and discounted benefits, such as present net value or benefit/cost ratio.

Indirect Effects for Employment and Income - Those effects that are linked to the direct effects by providing goods and services to the directly affected sectors. An example of indirect employment would be people who work in a generating plant that sells electricity to a pulp mill.

Induced Effects for Employment and Income - The effects that are linked through the direct and indirect effects income that consumers spending within the area. An example of induced employment would be grocery store employees who sell products to the people working in sawmills or generating plants.

Present Net Value - The difference between the discounted benefits and discounted costs.

Primary Zone of Influence - The area where social, economic, and/or environmental conditions are significantly affected by change in forest resource production or management (Ketchikan and Prince of Wales Island, Alaska).

Public Net Benefits - A measurement of economic efficiency. PNB are the sum of present net value and nonpriced commodities (such as scenic quality and community stability).

Affected Environment

This section provides a baseline for evaluating the economic and social condition of the Lab Bay Project Area. It is followed by an assessment of potential effects that could result from implementing a project alternative. Included is a discussion of regional employment and income; returns to the federal treasury; payments to state; economic efficiency; sales below cost; non-market and nonpriced values and cumulative effects.

Affected Communities

The primary zone of influence is defined as the area where change will have a direct effect on employment and income. The primary zone of influence for the purpose of this economic analysis is the region around Ketchikan, where the social, economic, and/or environmental condition is directly and significantly affected by changes in forest resource production or management. The area consists of the census areas of Ketchikan Gateway (AK89-130) and Prince of Wales-Outer Ketchikan (AK89-201).

Within the primary zone of influence are a number of communities directly affected by Lab Bay land use decisions. These communities include Ketchikan, Point Baker, Port Protection, Whale Pass, Coffman Cove and others. The economies of most communities depend almost exclusively on the National Forest to provide natural resources for uses such as fishing, hunting, tourism,

recreation, timber harvesting, mining and subsistence. There is very little private land to provide these resources. Consequently, maintaining the abundant local natural resources concern those who make a living there.

All have interests in how the forest will be managed. The study area vicinity is a mixture of town economic influences and remote lifestyles. Many of the area residents derive their incomes from economic activity in the towns and communities. At the same time, they value the area for the recreational and aesthetic opportunities that are present in the vicinity. While the livelihood of some people may depend indirectly upon the forest, they also have an important stake in its management, both for short-term economic considerations, and for the maintenance and fostering of their current lifestyles.

The year-round economy of Southeast Alaska is largely dependent on the timber, recreation/tourism, and commercial fishing industries. These industries provide the majority of jobs.

Most of the population in the area affected by the Lab Bay Project is concentrated in Ketchikan (1990 population 13,828). The same industries which dominated the area's history are still prominent. Local residents earn their living through the forest products industry, seafood harvesting and processing, recreation/tourism and its supporting industries. Transportation, communication, and retail industries, educational, health, and social services and four levels of government (municipal, borough, State, and Federal) also contribute to the local economy. Ketchikan's single largest employer is the Ketchikan Pulp Company (KPC).

Community Descriptions

Community stability for small timber producing communities on Prince of Wales Island is linked to levels of timber harvest on the island. The communities discussed have developed to their present condition based in large part on the historic timber harvest on the island as a whole, and to a lesser degree on historic timber harvest on the Lab Bay Project Area.

Coffman Cove

Coffman Cove was incorporated as a second class city in 1989. Of the 195 people employed, 146 people (75 percent) are directly employed in a timber related field. Fifty-five people are employed by KPC. The community has the capability to handle an annual capacity of 40 MMBF

with the size of the current labor force. In 1993 the workforce processed 33 MMBF and 43 MMBF in 1989. The data on Coffman Cove's historic population is limited. The census information goes back to only 1980. In 1980 the population was 193 residents. The 1990 census lists a population of 191 residents. The latest information on Coffman Cove's population lists 270 people (Source: Castleman and Pitcher 1992).

Ketchikan

Prior to the 1950's, growth in the Ketchikan area was a result of technological advances that sparked the development of the canning industry. The local fishing economy has had its ups and downs, declining in the 1940's and nearly collapsing in the 1970's, but is currently recovering to a fair degree. The timber industry has been present in Ketchikan since the Ketchikan Spruce Mill began operations in 1903, but was never a dominant part of the economy until the long-term timber sale contract was signed between the U.S. Forest Service and the Ketchikan Pulp Company in 1954. Ketchikan thus displays a very diverse economy. Timber and fishing are primary industries of great importance. The 1990 census of Ketchikan identifies a total population of 8,004 people. Of this total population 4,110 people are employed, with 1,242 people in the Agriculture (including forestry and fisheries), Construction, and Manufacturing trades. Government is also a dominant economic sector, while tourism is an important, although highly seasonal, industry.

Labouchere Bay

Lab Bay is a logging camp located at the northwest corner of the Project Area. The camp is located on U.S. Forest Service land, under special use permits, which require that all structures be removed when the logging operations cease. The state of Alaska has selected a small amount of land in the Lab Bay area, but for recreational use only. There are no plans for any private land disposal in the Lab Bay area, so it is unlikely to evolve into a permanent community such as Whale Pass. The 1990 population of Lab Bay was 149, but the camp was recently closed down and all KPC operations were transferred to either Naukati or Coffman Cove. The 1990 census information indicates that of the 70 people employed in Lab Bay, 60 of these were dependent on the timber industry with the remaining 10 in educational services.

Naukati

Naukati is a logging camp and unincorporated community with the 1990 census showing 93 people claiming residence. Of 60 people employed, approximately 92 percent are employed as manufacturers. This information was obtained from a sample of the Naukati population census survey. The survey does not reflect school employees due to their not receiving the census survey or reporting their residences elsewhere. It is assumed from the census survey that 55 employees are employed by KPC or its subcontractors in timber related fields. The few jobs that do exist outside KPC or its subcontractors are still largely dependent upon the timber industry. Naukati now houses all the Lab Bay camp employees.

Point Baker/Port Protection

These communities are located at the northwest corner of the Project Area, across an inlet from the Lab Bay logging camp. Approximately two miles of water separate the communities, although they are often considered one due to their location and similar economic base. The total population of these communities in the 1990 census was 102 people. The economic base is dependent on self-employed fishing. Local employment opportunities in other industries is very limited due to the small and isolated nature of these communities. Because of their dependence on fishing and subsistence hunting, many of the residents are opposed to the timber industry and nearby harvest activity.

Thorne Bay

Thorne Bay was incorporated as a second class city in 1982. Of the 241 people employed, approximately 134 (55 percent) are directly related to timber, with many of the rest indirectly employed because of the timber industry. Before 1982 approximately 90 percent of those employed were in a timber related field. Historically all timber harvested on Prince of Wales Island

for the KPC Long-term Sale (LTS) has been brought to Thorne Bay. Here it was scaled and sorted, then towed to Ward Cove for further processing. As future offerings are released under tree measurement specifications, some offerings might be scaled on site, then towed to Ward Cove. Employment in Thorne Bay is significantly affected by a steady flow of timber through the sort-yard. This active flow of timber through the sort-yard affects direct and indirect employment benefits in the community. The Census Bureau listed 443 residents in Thorne Bay in 1970, 322 residents in 1980, and 569 residents in 1990. The latest information on Thorne Bay's population lists 625 residents (Source: Thorne Bay City Administrator, 1992).

Whale Pass

Whale Pass is an unincorporated community. The 1990 census determined that 75 people claimed residence there. Of the 18 people employed, nine jobs are directly related to timber. The remainder of the work force is employed in educational services, entertainment, and recreation (Whale Pass Resort). The majority of local residents expressed the importance of the timber industry for wage earning residents in Whale Pass.

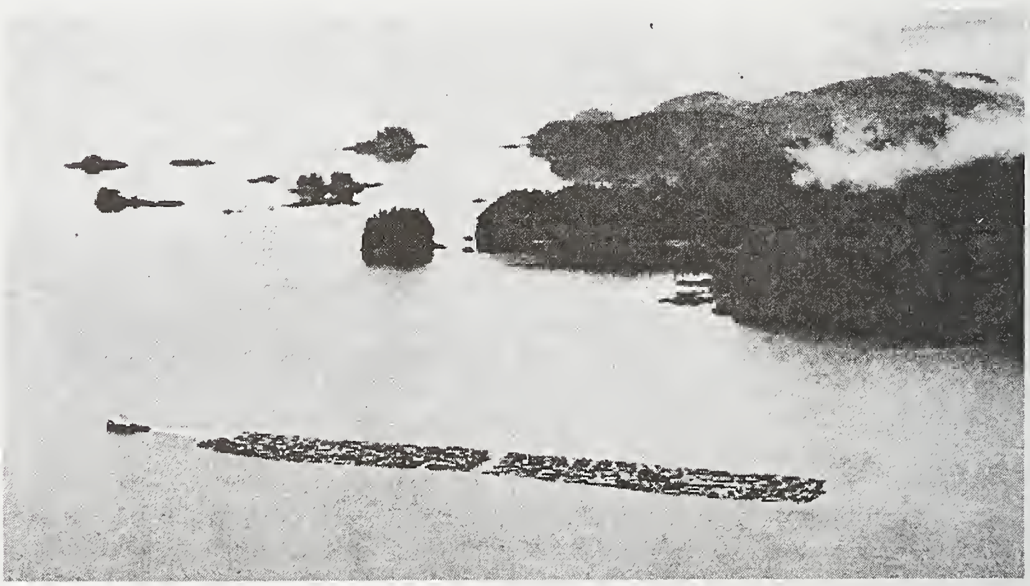
Timber Industry

Federal laws prohibit the export of most round logs from the Tongass National Forest. This has the direct effect on the area's employment of requiring some processing of Tongass timber. In 1990, 43 percent of the timber harvested in Southeast Alaska was from the Tongass while 56 percent was from private lands. About 93 percent of the privately harvested timber was exported in the round. Additionally, 93 percent of timber harvested from Native Corporation lands is exported. Therefore, the stability of jobs in the region's pulp mills and saw mills is directly tied to timber supplied from the Tongass.

Segments of the forest product industry which would be affected by the Lab Bay Project includes dissolving pulp, logs, cants, dimension lumber, and wood chips.

Because most of Alaska's forest products are exported, fluctuations in timber markets are primarily a function of international markets and do not necessarily reflect domestic markets alone. In 1990, the timber industry provided almost 20 percent more employment than it did in 1980.

A constant supply of Tongass timber is not the only factor controlling timber employment. Other controlling factors include foreign exchange rates, the overall Pacific Rim demand for wood products, and competition among timber suppliers outside the Tongass National Forest.



Commercial Fishing Industry

Harvesting and processing of fish provides a broad base of employment opportunities throughout Southeast Alaska. Many small towns and villages are economically dependent on fish harvesting and processing. The Ketchikan area supports diverse fish-based employment opportunities for bottom fish, herring, shell fish, salmon, and other seafood products. The fishing industry is highly seasonal. The potential for year-round employment is enhanced with the diversity of harvested species, harvest methods, and the processing methods. Expansion of the bottom-fish sector provides the greatest opportunity for increased employment and more year round employment opportunities (Alaska Department of Labor, Research and Analysis 1990).

Recreation and Tourism

During the 1980's, the tourism industry became a major factor in the economy of Southeast Alaska. Cruiseships traveling the Inside Passage made regular stops at Southeast Alaska ports, including Ketchikan, in record numbers. Newer and larger capacity ships as well as smaller ships tapping special interests are ushering a new era of tourism to Southeast Alaska ports. The visitor season currently runs from May through September. Cruiseship passenger numbers visiting Ketchikan have grown from 85,000 passengers in 1981 to over 263,000 in 1992. The economic impact of this industry is likely to increase.

Marketing studies by the Alaska Division of Tourism indicate that scenery, forest, mountains, out-of-doors, and unspoiled, rugged wilderness were the top interests appealing to potential nonresident visitors (Bright 1985). While these interests bring more nonresident visitors, resident recreation also increased during the 1980's, as indicated by increased fishing and hunting license sales. The tourism and recreation industry affects many sectors of the economy which also serve the local residents and businesses. For example, retail trade, personal services, lodging, eating and drinking, and transportation sectors serve both visitors and local residents and businesses.

A growth industry in the area, especially in the vicinity of Whale Pass, is guided trips. New lodge construction and operation also is taking place in areas such as Port Protection. This is resulting in increased employment, including spin-off jobs in lodging, food, etc. In addition, the Project Area overlays an extensive series of karst formations and caves. Tourism related to these features, especially in the El Capitan area, is just beginning but, due to the abundance and variety of the resources, is expected to increase in the foreseeable future.

Sport Fishing

Sport fishing is a major source of revenue to Southeast Alaska. The Southeast Alaska Sport Fishing Economic Study (1991), a research report done for the State of Alaska, contains Ketchikan area data:

> "In 1988, anglers spent $83.1 million for sport fishing in Southeast Alaska. Resident anglers spent about $40.7 million and nonresident anglers spent about $42.4 million. Resident anglers spent about $6.6 million on sport fishing in the Ketchikan area. For nonresident anglers, sport fishing in the Ketchikan area generated the most spending, comprising about $13.7 million, or 32 percent of all nonresident angler spending."

King salmon are the most sought after species by residents and nonresidents and generated the most spending. This has important significance for the local charter fleet, in 1988 accounting for $13.3 million, or about 32 percent of all resident angler spending, and accounting for $9.6 million, or 23 percent of all nonresident spending.

It was estimated that in 1988 angler spending contributed toward the generation of $1.5 million in local sales tax revenue, $105,000 in lodging tax, $135,000 in state corporate income tax, and $1.2 million in fishing license revenues. For nonresident anglers, fisheries in the Ketchikan area are the most valued throughout Southeast Alaska, with an annual "willingness-to-pay" value of $7.5 million. The willingness-to-pay concept can be described as a value which approximates market price.

Sport Hunting

The primary big game species in Southeast Alaska and the Ketchikan area, in terms of number harvested and hunter participation, is the Sitka black-tailed deer. Deer constitute over 90 percent of the total big game harvest in Southeast Alaska (Doerr & Sigman 1986). Estimating value using the willingness-to-pay concept (the amount hunters are willing to pay to harvest a deer) places deer hunting by resident Southeast Alaskans at $331 (Swanson et al. 1989). Hunting expenditures are not available in the Ketchikan area.

Factors Used in Measuring Economic Effects

Employment and Income

The Tongass timber program is part of a long-term cooperative effort among the Federal government, the State of Alaska, and local governments to provide greater economic diversity, and stable employment opportunities in Southeast Alaska. KPC's 50-year timber sale contract helped to guarantee the supply of raw materials necessary to attract new industry to Southeast Alaska at a time when the region's economic base was quickly eroding. Other forest resources, such as recreation, tourism, fishing, and hunting also contribute to local employment. The trade, service and government sectors are the largest in terms of employment, total income, and payment of indirect taxes in both the Project Area and the Ketchikan area.

The following table displays the level of economic production, employee compensation, total income, and jobs derived from the major industry groups in the primary zone of influence.

Table 3-115

Ketchikan Area Primary Influence Zone Input-Output Model Base Year Information (1985 dollars)

Industry	Total Industry Output (MM$)	Employee Compensation Income (MM$)	Total Place of Work Income (MM$)	Number of Jobs
Agriculture, Forestry & Fishing	$22	$4	$8	368
Construction	$71	$18	$31	538
Manufacturing*	$287	$59	$96	1,572
Transportation, Comm. & Utilities	$90	$21	$28	574
Wholesale & Retail Trade	$56	$26	$32	822
Finance, Insurance & Real Estate	$59	$9	$39	464
Services	$94	$38	$53	1,617
Government & Special Industries	$78	$58	$62	1,880
Total	**$757**	**$233**	**$349**	**7,835**

Source: Project Planning Record

* Includes logging, sawmills, and pulp mills

Returns to the Federal Treasury

Management of the National Forests generates revenues for the Federal treasury. Some uses of Tongass National Forest land and resources generate income which is paid to the Federal government. Returns from the Tongass National Forest range from $45 million in 1987 to over $56 million in 1988, and fluctuate from year to year. Timber sales are the source of about 99 percent of Federal receipts for this area. While revenue from timber sales dominates the returns, fees from recreation permits, admissions and user fees make a contribution as well.

Payments to State

Revenue from National Forest timber sales are shared with state and local governments. Twenty-five percent of the total revenues received by the National Forests are returned to state and local governments to support schools and roads. A percentage of all monies received (including purchaser road credits) from the Ketchikan Administrative Area is paid to the State of Alaska. During the nine year period 1983 to 1991, payments averaged almost $9 million annually, adjusted for inflation to 1990 dollars. Changes in these payments are of considerable interest to local residents.

Economic Efficiency

The harvesting of timber involves large investments. The economic efficiency of these investments is relevant to the choice among environmentally different alternatives being considered. This issue is addressed in three ways. First, the economic efficiency of alternatives will be evaluated. Historic costs for managing, harvesting and processing timber, and historic prices for various timber and wood products are identified, and the present net value (PNV) of the alternatives estimated. Second, the timber sales below cost will be evaluated. Third, other non-market and nonpriced issues are discussed. Many of these issues are non-quantifiable within the scope of this project and therefore are assessed in a qualitative way. For a comprehensive analysis, these factors must be considered along with the timber economics to determine the net benefit to the nation from timber harvest.

The National Forest Management Act of 1976 (NFMA) set requirements of economic efficiency for Forest Management proposals. The measurement of economic efficiency applied in formulating and evaluating alternatives is called the Public Net Benefits (36 CFR 219.1(a) and 219.12(f)). Public Net Benefits (PNB) are the sum of Present Net Value (PNV) and non-priced commodities. Examples of non-priced commodities include scenic quality, wildlife habitat, and community stability. Present Net Value is a method of adjusting revenues and costs to allow their comparison over time. Values of some non-priced commodities are inferred from observations such as the number of participants, tolerance of congestion and expense of participation.

Sales Below Cost

In response to concerns about the costs and revenues from timber sales on National Forest lands, especially sales where costs exceeded revenues, the General Accounting Office (GAO) and the Forest Service, at the direction of Congress, jointly developed the Timber Sale Program Information Reporting System (TSPIRS). TSPIRS reports are designed to describe financial and economic aspects of the forest-wide timber sale program. Managing timber is a long-term commitment of land and resources and a variety of activities occur each year on stands at various ages in their rotation. For this reason, many of the costs, such as roads and reforestation, are pooled and then redistributed over a series of years based on the amount of timber harvested. This is a different approach than is used in the calculation of present net value described above, where costs are measured in the year they occur and discounted back to the present.

While the system was designed for forest-wide purposes, it can be adapted to provide some insight into the sales below cost for areas smaller than the entire forest. It will be used in this context to evaluate the relationship of the alternatives to the sales below cost issue.

Large development costs usually accompany new timber sales. These costs in turn translate into revenue for local businesses and employment and income for local people. The TSPIRS reports provide a description of the extent of investments in timber harvesting on the Tongass National Forest. The Tongass National Forest had revenues in excess of expenses of almost $190,000 in 1988, $2.5 million in 1989, and $11.5 million in 1990. For this three year period, average revenues were slightly over $200 per thousand board feet, total controllable expenses averaged about $74 per thousand board feet, payments to the state averaged almost $43 per thousand board feet, for an average net gain of about $85 per thousand board feet.

Non-Market Values and Non-Priced Values

Non-Market Values

A discussion of the relationship between an economic benefit-cost analysis and the analysis of unquantified environmental effects, values, and amenities is useful in considering project Alternatives. In Forest Service terminology, three types of values are typically considered in economic evaluations: market values, non-market values, and non-priced values. Market values are those established through a market, such as timber. Non-market values are those that can be quantified using economic techniques that infer or deduce values which might prevail if a market were present, such as some types of recreation. These first two types are included directly in the benefit-cost analysis. Non-priced values refer to those for which it is impossible to quantify a value, even with non-market economic techniques, such as the value of religious sites or genetic diversity.

Recreation, fish and wildlife values are not typically established by a market, but are important considerations in making resource management decisions. As can be seen in Table 3-116 below, the highest recreation values are for non-consumptive wildlife use, other recreation activities, big game hunting, and winter sports.

Table 3-116
1990 Resources Planning Act Recreation and Other Benefit Values in Alaska

Activity	$/RVD[1]
Hiking, Horseback Riding, Water Travel	$10.64
Winter Sports	$42.62
Camping and Picnicking	$21.24
Mechanical Travel and Viewing Scenery	$16.65
Resorts	$17.26
Wilderness	$17.78
Other Recreation Activities (except Wildlife and Fish)	$61.00
	$/WFUD[2]
Big Game	$55.00
Small Game	$27.00
Non-Consumptive	$51.00

Source: 1990 RPA Program, Tables 5 and 5A (wildlife)

[1] Recreation Visitor Days

[2] Wildlife, Fish and User Days

Non-Priced Values

Non-market values can be applied to changes in the levels of some recreation, fishing and hunting activities associated with the alternatives to estimate the economic value of these changes. These values can then be incorporated into a benefit-cost analysis and a sales below cost analysis. There are many other values that people hold for which markets do not exist and to which market values cannot be attached, called non-priced values. Among others, these include active use values (subsistence), the value of the forest as habitat for wildlife, and passive use values. Passive use values include existence, option and other nonuse values (Mitchell and Carson 1989). An overview and discussion of how economics can assist in the forest management decision-making process is included in Peterson and Driver (1988). They discuss many of the difficulties associated with benefit-cost analyses in relation to timber sales and caution that "a public trust owner must include such external benefits [such as costs and benefits of the supply and demand for forest recreation and aesthetic opportunity] in the benefit-cost analysis in order to achieve economic efficiency."

Some important non-priced values are visual quality, diversity and quality of recreation opportunities, old growth retention, suitable habitat for threatened and endangered species, and cultural resources. Another is the value of retaining old growth forest and wilderness or semi-wilderness areas. This represents the value that people who will never visit the project area receive from knowledge that the area exists and the condition (or perceived condition) in which it exists. This value can be inter-generational since timber cuts conducted in the 1990's will be visible for over one human generation. Recent work in this field was conducted following the Exxon Valdez oil spill in Prince William Sound, Alaska. Quantitative studies were conducted to determine prices for these values and were based on people's willingness to pay to avoid habitat degradation. Such surveys, which must be conducted on a national or international basis, are beyond the scope of this project and have not been conducted for the Tongass as a whole. It should be noted that contingent values can be quite high. Those arrived at for the oil spill study determined that the people of the United States were willing to pay about $3 billion to avoid the oil spill (Carson et al. 1992). Similar values may exist for the Tongass, considering of the concern expressed by conservation and preservation organizations about Tongass logging practices and the reaction to these pressures by Congress.

Harvesting timber, including old growth, is considered use of a renewable resource. This is true to the extent that timber will regenerate to offer a direct substitute in terms of lumber, habitat, and "option value". To the extent that can't occur (especially in cases such as old growth), timber harvest may be considered an extraction of a nonrenewable resource.

Judgments are necessary in assessing whether benefits of maintaining non-priced values equal or exceed the trade-offs of producing priced values. While the quantitative dollar values of each cannot be determined, they generally can be examined by association with such quantitative indicators as acres, resource inventories, or timber production related activities and outputs.

Effects of the Alternatives

Employment and Income

Timber Industry

Each alternative will affect the number and composition of timber-related jobs within the communities in the primary zone of influence. The primary zone of influence is the Ketchikan region. The area consists of the census areas of Ketchikan Gateway (AK89-130) and Prince of Wales- Outer Ketchikan (AK89-201).

Table 3-117 displays the total estimated employment and income effects (direct, indirect, and induced) of each alternative. It is assumed that the entire harvest volume in each alternative would be offered in 4 years, with 9 percent in the first year, 26 percent the second year, 27 percent the third, and 38 percent harvested the fourth or last year of harvest. Actual harvest may occur over a shorter or longer time frame, and could follow or occur during road construction. These calculations are based on historic data which include year round operation of the KPC pulp mill. To the extent that this mill is closed and no substitute is used within the primary zone

of influence, these calculations overstate the jobs and income which would be generated by the action alternatives. As would be expected, employment opportunity closely parallels the volume of timber harvested.

Alternative 1 proposes no timber harvest. This could result in a decline in timber-related employment should KPC not be able to substitute volume from another source. The effects of Alternative 1 are not predictable but could range from elimination of shifts to a partial or even a full short-term shutdown. Possible long-term ramifications of Alternative 1 could be the destabilization of the wood products industry in the affected communities.

When this project was first considered a temporary logging camp was in place at Labouchere Bay. This camp had been in place since the late 1970's and consisted of families as well as single workers. Lab Bay was shut down completely in 1994 due to lack of nearby, available harvest units. Some of the workers were let go while others moved to the nearby logging communities of Naukati, Shelter Cove, and Coffman Cove. The floating Craik Logging camp came and left the Project Area during the past three years. Also, the Whale Pass log transfer facility was partially shut down in 1993.

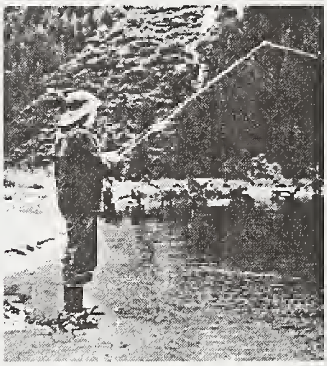
The relocations and layoffs experienced in the Project Area over the last several years is to be expected with reductions in timber harvests. However, since there is little if any harvest in the Project Area at this time, the No Action Alternative would not necessarily result in further unemployment or relocations.

Table 3-117

Ketchikan Area Primary Influence Zone Input-Output Model Projected Timber-Related Employment and Income

	Alternative					
Employment	**1 (jobs)**	**2 (jobs)**	**3 (jobs)**	**4 (jobs)**	**5 (jobs)**	**6 (jobs)**
Year 1	0	52	34	32	36	21
Year 2	0	151	98	92	103	59
Year 3	0	156	102	95	107	62
Year 4	0	220	143	134	151	87
Total Income	**(MM$)**	**(MM$)**	**(MM$)**	**(MM$)**	**(MM$)**	**(MM$)**
Year 1	0	3,119	2,027	1,904	2,137	1,230
Year 2	0	9,009	5,856	5,500	6,173	3,552
Year 3	0	9,356	6,081	5,712	6,411	3,689
Year 4	0	13,167	8,559	8,039	9,023	5,191

Source: Project Planning Record



Commercial Fishing

Current Forest Service standards and guidelines and management area prescriptions would limit measurable effects on fish during timber harvest and related activities. No substantive changes in the habitat of commercially harvested fish is predicted. Therefore, direct and indirect jobs attributable to National Forest System lands for the commercial salmon industry should remain unchanged for all alternatives. Log transfer facilities and marine transport of logs might have some harmful effect on commercial fishing; however, this is expected to be only marginal at worst.

Recreation and Tourism

Projections for employment in the recreation and tourism industries during the 1990's in Southeast Alaska include a 27 percent increase in recreation and tourism, a 36 percent increase in sport fishing and a 53 percent increase in hunting-related jobs (TLMP Draft Revision 1991a). The Project Area is expected to reflect these increases. Differences between alternatives, other than the No Action Alternative, should have little overall effect on these projections.

Because there is minimal use of the Lab Bay Project Area by large cruiseships and/or the Alaska Marine Highway ferries, and because the proposed alternatives will have minimal effect on the recreation places, no significant effect is expected on this sector of the recreation/tourism industry.

The continued development of karst resources in the Project Area could be affected by an action alternative. Any timber-related degradation of karst resources used or potentially used by people could lead to a decrease in related purchases of supplies and services. Also, due to the world class caliber of the karst topography in the Lab Bay area, degradation of these resources could lead to nonpriced losses to the nation as a whole.

As is more fully discussed in the subsistence section, future nonsubsistence hunting may be curtailed under any of the alternatives. This will be more severe under an action rather than a no action alternative. Reductions in nonsubsistence harvests, including guided hunts, would result in decreased expenditures on Prince of Wales Island for supplies and services, thereby directly impacting the local economy.

One growth sector in the recreation industry is sport fishing. Those participating in this sector would not be directly affected by any of the action alternatives since Forest Service standards and guidelines will protect all fish habitat. However, as numerous studies have shown, sport fishing is a multidimensional activity with catching fish comprising only one portion of the desired inputs. Sport fishers also gain benefits (the overall value is increased) by such factors as comradeship and atmosphere. To the extent that timber harvest activities and/or harvested areas detract from sport fishers' enjoyment of their activities, the value obtained will be less than it otherwise could have been. It is not possible to estimate these effects but they would depend on such factors as the location of fishing (stream bank versus offshore), home community, and previous experiences of the sport fisher (is she habituated to logged terrain or does she expect to see pristine forests). It is expected that all action alternatives would lead to decreases in recreational values for these reasons.

Economic Efficiency

Table 3-118 summarizes the differences in present net value between alternatives. The present net value represents the economic efficiency of each alternative, or the difference between discounted benefits and discounted costs. The present net value yardstick reflects historical average conditions for both prices and costs, and may not represent the economic viability of the Project Area in any given year. Each alternative has a specific management strategy or emphasis which requires certain timber harvest levels that may not be the most economically efficient harvest pattern for the Project Area. All development alternatives have a positive present net value, indicating that discounted direct costs associated with timber harvest are less than the discounted direct value of the benefits.

Historically the wood products market has been cyclic, with sharp peaks and valleys, resulting in fluctuations in pond log values. A modest change of a few dollars per thousand board feet can result in significant shifts in the economic supply of timber.

Table 3-118
Lab Bay Project Area Present Net Value of Action Alternatives

Alternative	Acres Harvested	Volume (MBF)	PNV (MM$)
2	4,550	101,322	$4.1
3	3,040	65,756	$2.5
4	2,919	61,745	$2.5
5	3,106	69,335	$2.6
6	1,885	40,065	$1.7

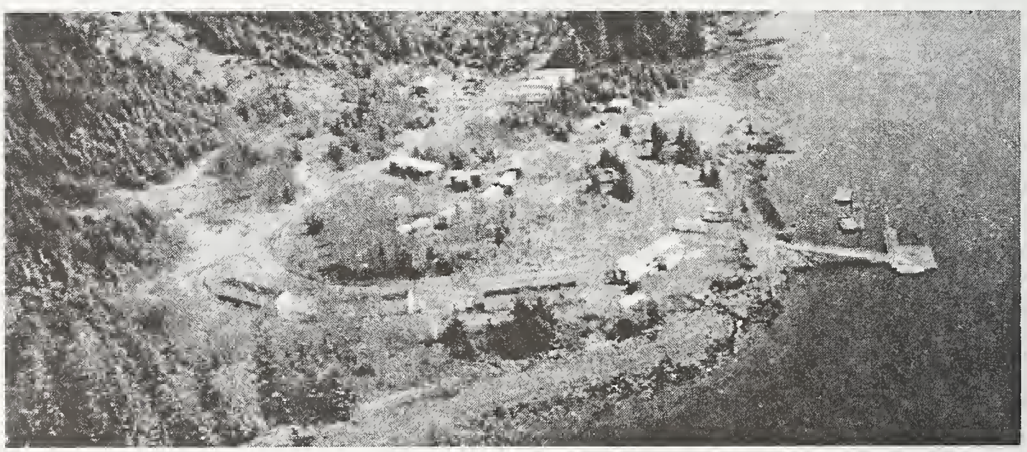
Source: Project Planning Record

Pond log values represent the delivered price of logs at the mill minus the costs to manufacture them into usable products. Pond log values were determined based on the mid-market value, which is a weighted median of historic quarterly pond log values. This is done to account for fluctuations in market prices. The mid-market pond log values are shown below in Table 3-119a and have been used for the PNV analysis. These values would fall roughly into the top 25% to 33% of the historical prices for Tongass National Forest timber.

Table 3-119a
Estimated Mid-Market Pond Log Values

	Alternative				
	Alt 2	Alt 3	Alt 4	Alt 5	Alt. 6
Pond Log Values ($/MBF)	$382	$383	$416	$390	$396

Source: Project Planning Record



Appraisal Summary

Each alternative has five geographically based unit groupings: Calder Bay, Lab Bay, Red Bay, Thorne Island, and Whale Pass. These groups each have different roading and harvest costs based on the terrain, logging methods, and distance to a log transfer facility. Tables 3-119b through 3-123b present estimated costs and profits associated with each alternative by grouping. Each alternative has separate values calculated for pond log values and species distribution.

This analysis has been completed using a mid-market and a current value approach. The mid-market analysis uses a long-term average of the historical pond log values, while the current value approach uses an estimate of the current pond log value. Since the value of timber harvested on the Tongass is influenced by international markets, the current value of Tongass timber can fluctuate greatly in short periods. Therefore, current pond log values may not be a good indicator of the economic viability of a timber sale sold in the future. The mid-market analysis was developed to estimate net revenues from future timber sales by accounting for short-term market fluctuations. As such, the mid-market analysis may more accurately reflect the risk of a timber sale not being economically viable if the market drops or is in a low cycle. Efforts such as this are often conducted prior to the preparation of a harvest analysis as a means of determining whether or not the offerings should be analyzed further. In this case, this presentation can be used to evaluate different offering areas within and between alternatives. The calculated net stumpage is indicative of comparative profitability rather than the magnitude of potential profitability.

As can be seen from Tables 3-119b through 3-123b, all alternatives show a positive return based on both the mid-market and current value assessment. The Lab Bay group consistently has the greatest positive return for all alternatives. Only the Calder Bay group in Alternative 4 and the Thorne Island group in Alternative 6 show a negative return for the mid-market assessment. The current value analysis shows positive returns for both of these groups. Due to the reliance on helicopter yarding for the Thorne Island uneven-aged management plan, the Thorne Island group in Alternatives 4 and 6 is more dependent on market conditions at the time of sale to determine economic viability than other geographic areas.

Table 3-119b
Summary of Economic Assessment for All Alternatives

	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Total Volume (mbf)	101,322	65,755	61,745	69,335	40,065
Mid-Market Pond Log Value ($/mbf)[1]	$382.00	$383.00	$416.00	$390.00	$396.00
Current Pond Log Value ($/mbf)[2]	$521.00	$521.00	$521.00	$521.00	$521.00
Total Harvest Costs ($/mbf[3])	$293.79	$296.57	$323.90	$303.47	$305.15
Profit and Risk ($/mbf)[4]	$36.72	$37.07	$40.49	$37.93	$38.14
Net Stumpage Value/MBF (Mid-Market)[5]	$51.49	$49.36	$51.61	$48.60	$52.71
Net Stumpage Value/MBF (Current Value)[5]	$190.49	$187.36	$156.61	$179.60	$177.71

Source: Project Planning Record

1 Mid-market pond log values are based on a weighted median of historical values and average species composition for the alternative.

2 Current pond log values are based on first quarter 1995 values and average Forest-wide species composition.

3 Costs from Transportation, Logging, and Facilities section, reduced by 12% estimated profit and risk.

4 Profit and risk equals 12.5% of total harvest cost.

5 Stumpage value = pond log value - (total harvest cost + profit and risk).

Table 3-120
Summary of Economic Assessment by Geographic Area for Alternative 2

	Calder Bay	Lab Bay	Red Bay	Whale Pass	Thorne Island	All Areas
Unit Volume (mbf)	7,672	45,544	11,175	10,705	8,119	83,215
Road Right of Way Volume (mbf)	500	8,107	3,100	2,900	3,500	18,107
Total Volume (mbf).	8,172	53,651	14,275	13,605	11,619	101,322
Mid-Market Pond Log Value ($/mbf)[1]	$382.00	$382.00	$382.00	$382.00	$382.00	$382.00
Current Pond Log Value ($/mbf)[2]	$521.00	$521.00	$521.00	$521.00	$521.00	$521.00
Stump to Truck Costs ($/mbf)[3]	$221.19	$109.45	$105.41	$110.70	$76.26	$113.92
Transportation Cost ($/mbf)[3]	$43.74	$53.50	$63.50	$45.14	$34.64	$51.03
Road Development Costs ($/mbf)[3]	$53.96	$101.82	$144.65	$174.64	$188.78	$119.98
Log Transfer Facility Costs ($/mbf)[3]	$0.00	$0.00	$0.00	$0.00	$7.55	$0.86
Administration Costs ($/mbf)	$8.00	$8.00	$8.00	$8.00	$8.00	$8.00
Total Harvest Cost ($/mbf)	$326.89	$272.77	$321.56	$338.48	$315.23	$293.79
Profit and Risk (12.5%)[4]	$40.86	$34.10	$40.20	$42.31	$39.40	$36.72
Mid-Market Return						
Stumpage Value ($/mbf)[5]	$14.25	$75.13	$20.25	$1.21	$27.37	$51.49
Advertised Rates ($/mbf)	$14.25	$75.13	$20.25	$1.21	$27.37	$51.49
Total Return (in $'s)	$116,441	$4,031,001	$288,997	$16,462	$317,968	$5,216,690
Current Value Return						
Stumpage Value ($/mbf)[5]	$153.25	$214.13	$159.25	$140.21	$166.37	$190.49
Advertised Rates ($/mbf)	$153.25	$214.13	$159.25	$140.21	$166.37	$190.49
Total Return (in $'s)	$1,252,349	$11,488,490	$2,273,222	$1,907,557	$1,933,009	$19,300,448

Source: Project Planning Record

1 Mid-market pond log values are based on a weighted median of historical values and average species composition for the alternative.

2 Current pond log values are based on first quarter 1995 values and average Forest-wide species composition.

3 Costs from Transportation, Logging, and Facilities section, reduced by 12% estimated profit and risk.

4 Profit and risk equals 12.5% of total harvest cost.

5 Stumpage value = pond log value - (total harvest cost + profit and risk).

Table 3-121
Summary of Economic Assessment by Geographic Area for Alternative 3

	Calder Bay	Lab Bay	Red Bay	Whale Pass	Thorne Island	All Areas
Unit Volume (mbf)	2,569	26,868	8,956	7,099	8,119	53,611
Road Right of Way Volume (mbf)	200	3,644	2,900	1,900	3,500	12,144
Total Volume (mbf)	2,769	30,512	11,856	8,999	11,619	65,755
Mid-Market Pond Log Value ($/mbf)[1]	$383.00	$383.00	$383.00	$383.00	$383.00	$383.00
Current Pond Log Value ($/mbf)[2]	$521.00	$521.00	$521.00	$521.00	$521.00	$521.00
Stump to Truck Costs ($/mbf)[3]	$227.52	$118.29	$82.48	$121.03	$76.26	$109.39
Transportation Cost ($/mbf)[3]	$45.04	$55.47	$63.92	$45.38	$34.64	$51.89
Road Development Costs ($/mbf)[3]	$63.46	$83.64	$171.38	$146.55	$188.78	$125.78
Log Transfer Facility Costs ($/mbf)[3]	$0.00	$0.00	$0.00	$0.00	$7.55	$1.51
Administration Costs ($/mbf)	$8.00	$8.00	$8.00	$8.00	$8.00	$8.00
Total Harvest Cost ($/mbf)	$344.02	$265.40	$325.78	$320.96	$315.23	$296.57
Profit and Risk (12.5%)[4]	$43.00	$33.18	$40.72	$40.12	$39.40	$37.07
Mid-Market Return						
Stumpage Value ($/mbf)[5]	($4.02)	$84.43	$16.50	$21.92	$28.37	$49.36
Advertised Rates ($/mbf)	$5.00	$84.43	$16.50	$21.92	$28.37	$49.36
Total Return (in $'s)	$13,845	$2,575,976	$195,594	$197,258	$329,587	$3,245,585
Current Value Return						
Stumpage Value ($/mbf)[5]	$133.98	$222.43	$154.50	$159.92	$166.37	$187.36
Advertised Rates ($/mbf)	$133.98	$222.43	$154.50	$159.92	$166.37	$187.36
Total Return (in $'s)	$370,984	$6,786,632	$1,831,722	$1,439,120	$1,933,009	$12,319,775

Source: Project Planning Record

1 Mid-market pond log values are based on a weighted median of historical values and average species composition for the alternative.

2 Current pond log values are based on first quarter 1995 values and average Forest-wide species composition.

3 Costs from Transportation, Logging, and Facilities section, reduced by 12% estimated profit and risk.

4 Profit and risk equals 12.5% of total harvest cost

5 Stumpage value = pond log value - (total harvest cost + profit and risk)

Table 3-122

Summary of Economic Assessment by Geographic Area for Alternative 4

	Calder Bay	Lab Bay	Red Bay	Whale Pass	Thorne Island	All Areas
Unit Volume (mbf)	2,569	25,663	8,642	10,705	3,557	51,136
Road Right of Way Volume (mbf)	200	5,109	2,400	2,900	0	10,609
Total Volume (mbf)	2,769	30,772	11,042	13,605	3,557	61,745
Mid-Market Pond Log Value ($/mbf)[1]	$416.00	$416.00	$416.00	$416.00	$416.00	$416.00
Current Pond Log Value ($/mbf)[2]	$521.00	$521.00	$521.00	$521.00	$521.00	$521.00
Stump to Truck Costs ($/mbf)[3]	$248.59	$125.58	$108.62	$121.67	$334.40	$139.22
Transportation Cost ($/mbf)[3]	$49.29	$56.16	$73.07	$49.55	$23.64	$55.03
Road Development Costs ($/mbf)[3]	$67.00	$116.12	$156.04	$149.17	$0.00	$121.65
Log Transfer Facility Costs ($/mbf)[3]	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Administration Costs ($/mbf)	$8.00	$8.00	$8.00	$8.00	$8.00	$8.00
Total Harvest Cost ($/mbf)	$372.88	$305.86	$345.73	$328.39	$366.04	$323.90
Profit and Risk (12.5%)[4]	$46.61	$38.23	$43.22	$41.05	$45.76	$40.49
Mid-Market Return						
Stumpage Value ($/mbf)[5]	($3.49)	$71.91	$27.05	$46.56	$4.21	$51.61
Advertised Rates ($/mbf)	$5.00	$71.91	$27.05	$46.56	$4.21	$51.61
Total Return (in $'s)	$13,845	$2,212,738	$298,728	$633,466	$14,957	$3,186,814
Current Value Return						
Stumpage Value ($/mbf)[5]	$101.51	$176.91	$132.05	$151.56	$109.21	$156.61
Advertised Rates ($/mbf)	$101.51	$176.91	$132.05	$151.56	$109.21	$156.61
Total Return (in $'s)	$281,081	$5,443,798	$1,458,138	$2,061,991	$388,442	$9,670,039

Source: Project Planning Record

1 Mid-market pond log values are based on a weighted median of historical values and average species composition for the alternative.

2 Current pond log values are based on first quarter 1995 values and average Forest-wide species composition.

3 Costs from Transportation, Logging, and Facilities section, reduced by 12% estimated profit and risk.

4 Profit and risk equals 12.5% of total harvest cost

5 Stumpage value = pond log value - (total harvest cost + profit and risk)

Table 3-123a

Summary of Economic Assessment by Geographic Area for Alternative 5

	Calder Bay	Lab Bay	Red Bay	Whale Pass	Thorne Island	All Areas
Unit Volume (mbf)	3,640	27,459	11,175	6,036	8,119	56,429
Road Right of Way Volume (mbf)	200	4,206	3,100	1,900	3,500	12,906
Total Volume (mbf)	3,840	31,665	14,275	7,936	11,619	69,335
Mid-Market Pond Log Value ($/mbf)[1]	$390.00	$390.00	$390.00	$390.00	$390.00	$390.00
Current Pond Log Value ($/mbf)[2]	$521.00	$521.00	$521.00	$521.00	$521.00	$521.00
Stump to Truck Costs ($/mbf)[3]	$198.38	$118.73	$105.41	$99.80	$76.26	$111.13
Transportation Cost ($/mbf)[3]	$41.82	$56.14	$63.50	$50.02	$34.64	$52.93
Road Development Costs ($/mbf)[3]	$56.97	$98.59	$144.65	$179.83	$188.78	$130.15
Log Transfer Facility Costs ($/mbf)[3]	$0.00	$0.00	$0.00	$0.00	$7.55	$1.26
Administration Costs ($/mbf)	$8.00	$8.00	$8.00	$8.00	$8.00	$8.00
Total Harvest Cost ($/mbf)	$305.17	$281.46	$321.56	$337.65	$315.23	$303.47
Profit and Risk (12.5%)[4]	$38.15	$35.18	$40.20	$42.21	$39.40	$37.93
Mid-Market Return						
Stumpage Value ($/mbf)[5]	$46.68	$73.36	$28.25	$10.14	$35.37	$48.60
Advertised Rates ($/mbf)	$46.68	$73.36	$28.25	$10.14	$35.37	$48.60
Total Return (in $'s)	$179,266	$2,322,865	$403,197	$80,501	$410,920	$3,369,421
Current Value Return						
Stumpage Value ($/mbf)[5]	$177.68	$204.36	$159.25	$141.14	$166.37	$179.60
Advertised Rates ($/mbf)	$177.68	$204.36	$159.25	$141.14	$166.37	$179.60
Total Return (in $'s)	$682,306	$6,470,980	$2,273,222	$1,120,117	$1,933,009	$12,452,306

Source: Project Planning Record

1 Mid-market pond log values are based on a weighted median of historical values and average species composition for the alternative.

2 Current pond log values are based on first quarter 1995 values and average Forest-wide species composition.

3 Costs from Transportation, Logging, and Facilities section, reduced by 12% estimated profit and risk.

4 Profit and risk equals 12.5% of total harvest cost

5 Stumpage value = pond log value - (total harvest cost + profit and risk)

Table 3-123b

Summary of Economic Assessment by Geographic Area for Alternative 6

	Calder Bay	Lab Bay	Red Bay	Whale Pass	Thorne Island	All Areas
Unit Volume (mbf)	0	15,730	6,838	7,393	3,557	33,518
Road Right of Way Volume (mbf)	0	2,447	2,000	2,100	0	6,547
Total Volume (mbf)	0	18,177	8,838	9,493	3,557	40,065
Mid-Market Pond Log Value ($/mbf)[1]	$396.00	$396.00	$396.00	$396.00	$396.00	$396.00
Current Pond Log Value ($/mbf)[2]	$521.00	$521.00	$521.00	$521.00	$521.00	$521.00
Stump to Truck Costs ($/mbf)[3]		$127.43	$83.27	$118.07	$334.40	$133.85
Transportation Cost ($/mbf)[3]		$55.61	$61.42	$46.86	$23.64	$51.47
Road Development Costs ($/mbf)[3]		$92.81	$155.54	$149.49	$0.00	$111.83
Log Transfer Facility Costs ($/mbf)[3]		$0.00	$0.00	$0.00	$0.00	$0.00
Administration Costs ($/mbf)		$8.00	$8.00	$8.00	$8.00	$8.00
Total Harvest Cost ($/mbf)	$0.00	$283.85	$308.23	$322.42	$366.04	$305.15
Profit and Risk (12.5%)[4]	$0.00	$35.48	$38.53	$40.30	$45.76	$38.14
Mid-Market Return						
Stumpage Value ($/mbf)[5]	$396.00	$76.67	$49.24	$33.28	($15.80)	$52.71
Advertised Rates ($/mbf)	$396.00	$76.67	$49.24	$33.28	$5.00	$52.71
Total Return (in $'s)	$0	$1,393,608	$435,194	$315,903	$17,785	$2,111,676
Current Value Return						
Stumpage Value ($/mbf)[5]	$521.00	$201.67	$174.24	$158.28	$109.21	$177.71
Advertised Rates ($/mbf)	$521.00	$201.67	$174.24	$158.28	$109.21	$177.71
Total Return (in $'s)	$0	$3,665,733	$1,539,944	$1,502,528	$388,442	$7,119,801

Source: Project Planning Record

1 Mid-market pond log values are based on a weighted median of historical values and average species composition for the alternative.

2 Current pond log values are based on first quarter 1995 values and average Forest-wide species composition.

3 Costs from Transportation, Logging, and Facilities section, reduced by 12% estimated profit and risk.

4 Profit and risk equals 12.5% of total harvest cost

5 Stumpage value = pond log value - (total harvest cost + profit and risk)

Variances in volume per acre, species mix, logging systems, log-haul distance, road construction and reconstruction costs, camp mobilization costs, and profit and risk allowances affect both the pond log values and logging, transportation, and construction costs. Costs and revenues used in the assessment represent averages for each sale area. Although individual units, or even entire sales, may not be economical to harvest by themselves, the management of less productive lands or lands containing a high percentage of defective timber will help to increase future timber yields. The harvest of units with higher returns will help compensate for those that are less economical.

Prior to the time each geographic area, within an alternative selected for implementation, is offered, each unit and road will be cruised by the Forest Service to accurately determine the quantity, quality, and value of the timber. A formal appraisal and timber sale report will be prepared incorporating current quarter selling values and cost information plus a normal profit and risk margin using the assumption of an operation of average efficiency. Site-specific envi-

ronmental investments, for example reforestation of cedar by hand planting, will be included in KV sale area improvement plans, timber sale appraisals, and contracts. The purpose of this appraisal is to establish a framework in which a minimum acceptable selling value can be estimated.

Individual units and geographic areas of economic concern are described in detail in Appendix Q.

Recreation

The amount of roaded vs. unroaded area in each of the action alternatives would vary, but is expected to meet the needs of many users. It is assumed that, year-to-year, the net effect to nonconsumptive users is unquantifiable; however, they likely would be affected during timber harvest activities. As an area changes over time, users will either adapt, be displaced, or substitute their leisure activities. Reforestation of the areas along the road system should take between 5 to 10 years to produce new trees. This will raise both the intrinsic and aesthetic value of visitors' experiences, a value that will increase as the forest regenerates. It should be noted that any substitution of leisure activities away from the Project Area due to harvests would be the result of choosing a "second best" leisure activity (i.e. finding a more suitable recreation experience elsewhere). This would result in a loss to society. Conversely, road development might lead to an increase in visitation resulting in a gain to society as the Project Area becomes a "preferred" destination for some. Certainly roaded recreation opportunities will increase under each of the action alternatives.

Sales Below Cost

TSPIRS reports are designed to describe financial and economic aspects of the forest-wide timber sale program. While the system was designed for forest-wide purposes, it can be adapted to provide some insight into the sales below cost issue for areas smaller than the entire forest. It is used in this context to evaluate the relationship of the alternatives to the sales below cost issue. Table 3-124 shows the net gain from timber sales estimated for each alternative in the Lab Bay Project Area.

Table 3-124
Timber Sale Revenues and Expenses
Tongass-Ketchikan Area, Estimated Values

Account Description	Alt 1 (M$)	Alt 2 (M$)	Alt 3 (M$)	Alt 4 (M$)	Alt 5 (M$)	Alt 6 (M$)
Total Controllable Expenses	$0	$8,125	$5,187	$4,071	$5,242	$2,998
Gain/Loss Bfr Pmts To State	$0	$11,175	$7,133	$5,599	$7,210	$4,122
Payments To States	$0	$4,825	$3,080	$2,418	$3,113	$1,780
Net Gain/Loss From Timber Sale	$0	$6,350	$4,053	$3,181	$4,097	$2,342

Source: Project Planning Record

All action alternatives show a net gain to the federal government when evaluated using the TSPIRS accounting conventions and the average historical relationships. Market price fluctuations, costs of selling and harvesting timber, and changes in general administrative costs per volume harvested could have different results than these estimates.

Non-timber Harvest Values

Neither the Present Net Value nor the TSPIRS accounting conventions consider non-timber harvest values. Land uses that result in decreased visitations or in a change from higher-valued

to lower-valued visitor use will result in a net loss to society. Likewise, any activities which decrease society's willingness to pay for the area result in a loss.

It is not possible to quantitatively compare these priced and non-priced values. Non-priced or non-market values resulting from the proposed action are expected to result in losses due to reduced deer and other wildlife populations, decreases in the value of "nature" tourism related to the proposed action, decreases in societal willingness to pay for post-logged landscapes, and losses to other resources discussed in this impact statement. Benefits or gains would be realized from employment and profits, government revenues, increased access in the Project Area, and other factors discussed in this impact statement. Methods of accounting differ between TSPIRS and PNV, the difference being that road costs are charged over an extended time period instead of at time of construction. Depending on which accounting method is used in combination with expected non-priced costs and benefits, the non-priced factors could make the difference between a net gain or net loss to the nation from this project.

Returns to Governments

Federal Treasury

The following table shows estimates of the effects of the Lab Bay Project on returns to the Federal Treasury. The estimates are based upon the current market appraisal summary presented previously in Tables 3-120 through 3-123b. Purchaser road credits are monies credited to the contractor for road construction in lieu of payments for timber.

Table 3-125
Timber Sale Revenues
Estimated Distribution to Federal Government

Account Description	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt. 6
Revenue	(M$)	(M$)	(M$)	(M$)	(M$)	(M$)
Timber Sales	$0	$7,118	$4,032	$2,143	$3,411	$2,629
Purch Road Credits	$0	$12,130	$8,254	$7,495	$9,005	$4,471
Associated Charges	$0	$26	$17	$16	$18	$10
Interest and Penalties	$0	$26	$17	$16	$18	$10
Total Revenues	**$0**	**$19,300**	**$12,320**	**$9,670**	**$12,452**	**$7,120**

Source: Project Planning Record

Payments to the State and Local Government

When payments under the state revenue sharing provision change, state and local governments must compensate with other sources of revenue to maintain the same quality and quantity of school and road programs. These shared revenues fluctuate over time and are not highly predictable for local school and road program budgeting. As payments fluctuate, these programs are directly affected, while other programs are indirectly affected as compensating budget adjustments are made.

Tables 3-126 and 3-127 display the anticipated total timber receipts as well as estimated revenue sharing with state and local government. Payments to the state are 25 percent of the estimated total revenues from the timber sale program.

Table 3-126
Estimated Payments to State

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Payments to State (M$)	$0	$4,825	$3,080	$2,418	$3,113	$1,780

Source: Project Planning Record

Table 3-127
Estimated Distribution of Payments to State and Local Governments

Boroughs	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Haines	$0	$264,893	$169,092	$132,748	$170,904	$97,722
Juneau	$0	$477,193	$304,612	$239,140	$307,876	$176,042
Ktn. Gateway	$0	$215,195	$137,368	$170,843	$138,840	$79,388
Sitka	$0	$523,513	$334,180	$262,353	$337,761	$193,130
Unorganized	$0	$3,344,690	$2,135,056	$1,676,158	$2,157,932	$1,233,896

Source: Project Planning Record

Cumulative Effects

The cumulative effects of each of the alternatives on the economic and social environment are quite difficult to estimate. There are a wide variety of factors affecting the employment, income, receipts, population, lifestyle, and community stability of Southeast Alaska. While it is not easy to project the incremental effects of the proposed actions on the Project Area, there are two facets of long-term timber harvest that can be addressed.

First, from the standpoint of employment, personal income, population, community services, and community stability, there is substantial benefit to maintaining long-term timber harvest levels. The receipts generated, including revenue to the U.S. Treasury, payments to the State of Alaska, taxes, and dollars brought into the community, all represent an economic benefit of continued timber harvest activity. The TLMP Draft Revision (1991a) schedules areas for long-term timber harvest activity to meet these economic and social needs.

The second facet of a long-term timber harvest program that can be addressed is the alteration of the natural environment that takes place when roads are constructed and timber harvested. Some of the economic and social value of Southeast Alaska is dependent on its natural setting. The recreation and tourism industry is based primarily on the natural conditions and scenic quality. As more and more acres of National Forest System Lands and other lands are converted from a natural condition to a managed forest, the activities dependent on and the values attributed to the natural state of the forested land will be affected.

The balance necessary to maintain a viable or even robust economic and social environment is set at a National Forest level, not at a project level. It is expressed in the Project Area by LUD's. Based on regional standards and guidelines, the action alternatives have been constructed to minimize the negative cumulative effects on the economic and community values of the affected

communities when considering the total resource. Cumulative effects on employment have been analyzed and are presented in the 1996 TLMP Draft Revision (1996). This analysis indicates that for the Ketchikan area as a whole, National Forest System-based timber employment and commercial fishing employment will remain fairly constant, while recreation and tourism employment will increase in the future. Harvesting in the Lab Bay Project Area is included as part of the overall harvest level assumed as a basis for this projection.

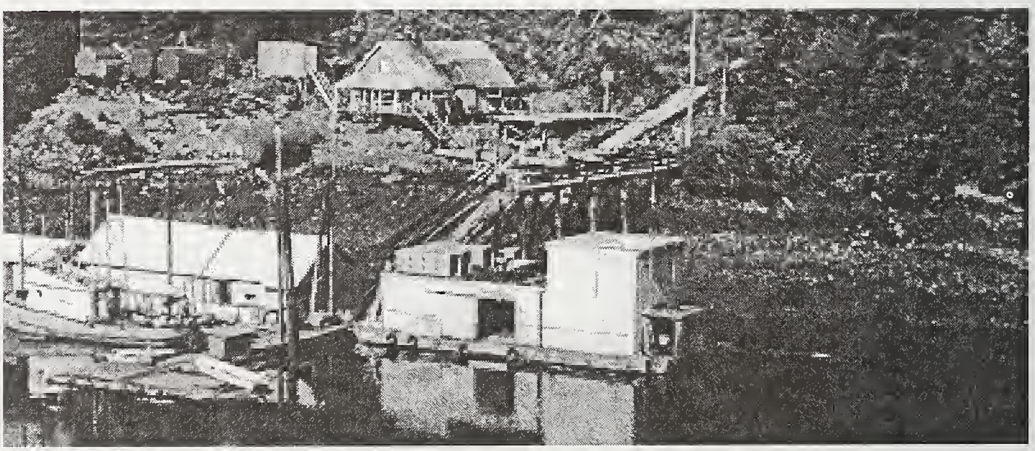
There are also potential cumulative effects from the broader national perspective. A national-level economic efficiency analysis considers whether a proposed investment will return benefits (regardless of who will accrue them), equal to or greater than the costs (regardless of who will pay them). When costs exceed benefits, the implication is that the national resources invested in the project could be put to more economically efficient use elsewhere. The cumulative effect of implementing investments of a deficit-contributing nature must be carefully weighed against the employment and income benefits accruing to local communities.

Effects on Communities

The communities profiled in this section exhibit varying degrees of dependence on continued timber harvest on Prince of Wales Island. Some of the smaller communities were established as a result of timber harvest operations while others were established before the Long-term Contract was enacted. Older communities such as Craig and Klawock, located in the central portion of the island, have a more diversified economic base which now includes timber harvest and support industries along with tourism and fishing.

Timber harvest is one of a variety of ways of maintaining community stability. Another way could be to create more value-added opportunities such as further processing of wood products. This could include the manufacturing and export of plywood, furniture, or cedar crafts. Value-added opportunities may also exist for other local resources such as the labor supply. For example, workers could be retrained in new industries. Import substitution is another possibility. The primary influence zone economy relies heavily on imports, both for business and for household consumption. Possibilities may exist for developing local suppliers to substitute for some imports. Several other possibilities include expanding existing natural resource-based industries such as tourism and sport fishing.

One consequence of timber harvests at the level projected by the Forest Plan is the degree of continued stability of communities dependent on timber from the Project Area. Changes in timber harvest will have different effects on each community. Economic effects to the communities would vary by their dependency on the timber industry. The projected decline in timber harvest would have a greater effect on a community like Naukati, with 55 of its 60 jobs provided by KPC or its contractors, than on the community of Klawock with only 103 of its 267 jobs in the timber or timber related field (Galginaitis 1993).



As the mature timber resource base is harvested, and yearly harvests decrease in volume, it is probable that fewer workers would be required for the timber harvest and transport in the Lab Bay area. This reduction in local work force could result in a decreased population in logging communities in the area such as Thorne Bay and Naukati and, most likely, only temporary openings of Project Area logging camps (Labouchere Bay and Craik Logging). Alternately, workers might increase their commuting distances and change employment patterns such as living part of the time at work camps. Decreased volume or halting of harvests from the Project Area in certain years could also result in a reduced labor force at local and regional processing facilities, other support facilities, and could have ripple effects throughout the regional economy.

Mitigation

Mitigation measures could be undertaken to improve net national benefits from the Project Area. This project addresses only timber investment opportunities. All of the action alternatives have a positive mid-market and current value assessment. Other natural resource investment opportunities may offer comparable investment choices, and at the same time contribute to mitigating potential community stability goals.

Monitoring

A monitoring plan has been developed for the Tongass National Forest by the Forest Planning Team and is described in the TLMP Draft Revision (1991a). The Forest Plan contains no specific monitoring goals for socio-economic resources.

Project-specific monitoring that is unique to the Lab Bay Project Area, and that would not be included in regular Forest Plan or routine implementation monitoring, has been identified for several resources. Project-specific monitoring is not identified for socio-economic resources in the Lab Bay Project Area.

Chapter 2 summarizes how project activities relate to Forest Plan and Ketchikan Area Monitoring plans, and describes project-specific monitoring opportunities.

Subsistence

Looking Southeast from Road 20 at Duck Creek bridge

Key Terms

Alaska National Interest Lands Conservation Act (ANILCA) - Federal law passed in 1980 which requires evaluations of subsistence impacts before changing the use of certain Federal lands.

Habitat Capability (HC) - The long-term potential of an area to support animals.

Habitat Capability Model (HCM) - Mathematical models which estimate habitat capability for a species. The models do not predict actual populations.

Nonrural - Generally a community with more than 7,000 people; doesn't qualify for priority use of subsistence resources.

Rural - All Southeast Alaska communities except Juneau and Ketchikan. Residents qualify for priority use of subsistence resources under ANILCA.

Game Management Unit (GMU) - A geographical division of land designated by the Alaska Department of Fish and Game for game management and regulatory purposes. There are a total of 26 such units in the state of Alaska.

Subsistence - Customary and traditional uses by rural Alaskans of wild renewable resources.

Tongass Resource Use Cooperative Study (TRUCS) - Research program documenting subsistence harvest and land use patterns in 30 Southeast Alaska communities conducted in 1988, directed by the University of Alaska's Institute of Social and Economic Research and carried out as a joint effort by the USDA Forest Service and the Division of Subsistence of the Alaska Department of Fish and Game.

Wildlife Analysis Area (WAA) - A division of land designated by Alaska Department of Fish and Game and used by the Forest Service for wildlife analysis. WAA boundaries are generally based on watersheds.

The Forest Service's standards and guidelines for subsistence resources are derived directly from Title VIII of the Alaska National Interest Lands Conservation Act (ANILCA) of 1980, which recognizes the importance of subsistence activities to the rural communities of Alaska. "Subsistence uses" are defined in Section 803 as:

> The customary and traditional uses by rural Alaska residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption; for barter, or sharing or family consumption; and for customary trade.

Section 804 defines the Federal obligation to provide for subsistence activities:

> Except as otherwise provided in this Act and other Federal laws, the taking on public lands of fish and wildlife for nonwasteful subsistence uses shall be accorded priority over the taking on such lands of fish and wildlife for other purposes.

This section further states that subsistence harvest can be restricted or prohibited to protect the continued viability of those resources. The criteria for imposing limitations are summarized as customary and direct dependence, local residency, and the availability of alternative resources.

The Federal Subsistence Board manages subsistence use of fish and wildlife resources on Federal lands. The taking of fish and wildlife under the Federal Subsistence Program is restricted to rural Alaskan residents. Everyone else must hunt under general state regulations. In Southeast

Alaska, the communities of Juneau and Ketchikan (excluding Saxman) have been declared nonrural by the Federal Subsistence Board.

Nonsubsistence hunters are subject to state hunting regulations. Because state regulations do not provide a rural subsistence priority, Federal Subsistence Board rulings on access to limited wildlife resources effectively override any state authority. On Federal land when this occurs, hunting is allowed only under Federal regulations.

Many Southeast Alaska communities incorporate the use of subsistence resources into the patterns of community livelihood. Nearly a third of rural households have reported obtaining 50 percent or more of their meat and fish from hunting and fishing (Kruse and Muth 1990). Fish and game are widely preferred sources of food, regardless of household income, which is not a reliable indicator of the importance of subsistence to a community. The harvesting of subsistence resources is an important social and cultural activity, reflecting deeply held attitudes, values, and beliefs, even for those subsistence participants who could afford to purchase all their food. This is true for nonnatives as well as for Natives. Some foods are not available through any means other than subsistence, and occasions for gathering or consuming subsistence resources are often social events. The distribution and sharing of subsistence resources between households within communities, as well as among different communities, is an important regional dynamic.

Subsistence activities represent a major focus of life for rural residents, and include hunting for deer, bear, marine mammals, and birds; digging clams and catching fish; harvesting marine invertebrates; trapping furbearers; collecting firewood; collecting herring eggs; and collecting berries and other plants and roots. These activities are often integrated with "cash economy" activities such as commercial fishing or seasonal wage employment as part of a conscious lifestyle choice. Subsistence cannot be discussed solely in terms of economic factors. The ultimate value of subsistence activities is derived from the overall process of engaging in the activities. This includes not only the annual cycle of planning activities, harvesting and processing resources, and the distributing, sharing, and consuming of subsistence products, but also the life cycle of first learning subsistence skills and values from one's elders and then eventually teaching these skills and values to one's descendants.

Affected Environment

Tongass Resource Use Cooperative Survey (TRUCS)

In 1988, a detailed subsistence resource and use inventory of the Tongass National Forest was started as part of the TLMP Draft Revision (1991a). The TRUCS of 1988 was directed by the University of Alaska's Institute of Social and Economic Research in conjunction with the Forest Service and the ADF&G Division of Subsistence (Kruse et al. 1988).

In the TRUCS, researchers went to 30 communities in Southeast Alaska and conducted interviews with randomly selected households about their 1987 subsistence uses. As part of the interview, household residents were also asked to indicate on a map those areas used for hunting and fishing. All figures used in reporting subsistence were based on this sample of households. Therefore, it is possible that actual amounts harvested were either higher or lower than TRUCS reported. A detailed description of the survey is found in the TRUCS Technical Report Number One (Kruse et al. 1988).

Wildlife Analysis Areas (WAA's)

Most of the data in this report is analyzed by WAA's, management units delineated by the Alaska Department of Fish and Game (ADF&G) and the smallest units for which harvest statistics are available. WAA's that are partially or totally within the Project Area are 1527, 1528, 1529, and 1530. These are described in the Wildlife section.

Affected Communities

Communities selected for detailed study as part of the Lab Bay EIS are those which reported harvesting at least five percent of their deer from the WAA's in the Project Area (Table 3-128). These communities and logging camps include Coffman Cove, Craig, Hollis, Ketchikan, Kla-

wock, Labouchere Bay, Naukati Camp, Petersburg, Point Baker, Port Protection, Whale Pass, and Wrangell. Metlakatla and Skowl Arm/Polk Inlet were excluded from this list, mainly because of low overall community harvest, distance from the Project Area, and preliminary contacts in those communities indicating little use of the Project Area.

Table 3-128

Deer Harvest Data for Localities with Any Reported Harvest Four Year Total 1988-1991

Community	WAA 1527 Harvest	WAA 1528 Harvest	WAA 1529 Harvest	WAA 1530 Harvest	Com. Project Area Harvest Total	Com. Project Area Harvest % Tot PA	Com. Project Area Harvest %Tot Com.	Other WAA's	Total Harvest
COFFMAN COVE	12	4	0	65	81	4.56	**19.01**	345	426
CRAIG	9	9	146	32	196	**11.04**	*8.60*	2,082	2278
Craik Logging	No Recorded Harvest — See Note				0	0		See Note	
Hollis	0	0	5	5	10	0.56	*12.05*	73	83
Hydaburg	0	0	3	0	3	0.17	2.07	142	145
Juneau	0	0	0	6	6	0.34	0.04	14,837	14843
KETCHIKAN	38	7	208	274	527	**29.69**	8.62	5,584	6111
KLAWOCK	39	21	64	0	124	*6.99*	**10.78**	1,026	1150
LABOUCHERE BAY	1	0	152	0	153	**8.62**	**92.17**	13	166
Metlakatla	5	0	6	3	14	0.79	9.46	134	148
Naukati Camp	0	0	0	6	6	0.34	5.22	109	115
Other Alaska	0	0	0	5	5	0.28	0.03	16,639	16644
Outside Alaska	0	15	7	0	22	1.24	*7.97*	254	276
Petersburg	16	55	69	19	159	**8.96**	3.57	4,299	4458
POINT BAKER	5	8	49	0	62	3.49	**81.58**	14	76
PORT PROTECTION	0	0	16	0	16	0.90	**100**	0	16
Saxman	No Recorded Harvest — See Narrative				0	0	0	29	29
Skowl Arm/Polk	0	0	8	0	8	0.45	9.09	80	88
Thorne Bay	6	7	5	6	24	1.35	1.72	1,370	1394
WHALE PASS	8	9	11	89	117	6.59	**64.29**	65	182
WRANGELL	0	35	18	189	242	**13.63**	**18.11**	1,094	1336
TOTALS	139	170	767	699	1,775	99.99			

Source: ADF&G

BOLD indicates most significant harvests (as part of community's total harvest, total harvest from WAA or Project Area, or both).

ITALIC indicates harvests potentially significant for other than numerical values.

Craik Logging is a floating logging camp that moved into Calder Bay in 1992.

Source: ADF&G Hunter Survey Information

Four other communities or camps were considered for inclusion in this study: Craik Logging, Saxman, Thorne Bay, and Hydaburg. Craik Logging is a floating logging camp which moved into the study area in early 1992 and thus had no previously documented subsistence use of the Project Area. Saxman is a predominately native community close to Ketchikan for which ADF&G and TRUCS information may be incomplete. Thorne Bay is a road-connected community of potential interest for comparative purposes. Hydaburg is a predominately native village on southern Prince of Wales Island. Traditional Hydaburg territory does not include the Project Area, and interviews with Hydaburg residents indicate that they rarely travel this far to hunt. Information developed for Saxman, Thorne Bay and Hydaburg indicated a low level of subsistence use of the Project Area (Table 3-128). Only Craik Logging was added to the list of study communities (even though they moved out of the Project Area during 1994) since this allows the issue of "transient" rural resident demand for deer to be addressed. Those communities considered for but excluded from detailed analysis in this EIS (Metlakatla, Skowl Arm/Polk, Saxman, Thorne Bay, Hydaburg, and Edna Bay) are dealt with in summary form in the effects portion of this chapter.

All of these study communities and camps are "rural," except for Ketchikan. Their subsistence use is characterized in the tables which follows. Table 3-129 presents demographic data; and Table 3-130 presents pounds of subsistence harvested per capita. Figure 3-22B displays this information by type of harvest for each community.

Table 3-129
Communities and Logging Camps*, Prince of Wales Island and Other SE Alaska Communities

Place	Pop. (TRUCS or 1990)	Native/ Nonnative (%)	No. Households Included in TRUCS Sample	Vacancy Rate	Subsistence Harvest (lb/capita,total lbs)		Subsistence Dependence (Meat)	Mean per Capita Income ($)
N. Whale Pass	50	5/95	18 of 18, 100%	51%	186	9,000	43%	11,618
Point Baker	35	7/93	19 of 19, 100%	26%	345	12,000	53%	6,212
Port Protection	58	7/93	25 of 27, 93%	34%	311	18,000	46%	5,912
Hollis	82	18/82	29 of 32, 91%	52%	164	13,000	42%	9,537
Coffman Cove	224	0/100	41 of 66, 62%	14%	186	35,000	25%	14,425
Klawock	795	45/55	52 of 224, 23%	15%	239	186,000	36%	5,853
Craig	1,182	28/72	64 of 365, 18%	6%	189	219,000	25%	12,121
Wrangell	2,913	38/62	75 of 1,013, 7%	NK	164	466,000	23%	11,989
Petersburg	4,149	14/86	54 of 1,140, 5%	NK	203	772,000	31%	12,602
Labouchere Bay	149	1/99		Not Known (not part of TRUCS sample)				
Naukati	93	1/99		Not Known (not part of TRUCS sample)				
Craik Logging	70	0/100		Not Known (not part of TRUCS sample)				
Ketchikan	12,705	15/85		Not Known (not part of TRUCS sample)				

Source: Information contained in USDA, Forest Service, December 1991; Kruse and Muth 1990; Kruse and Frazier 1988; and field notes.

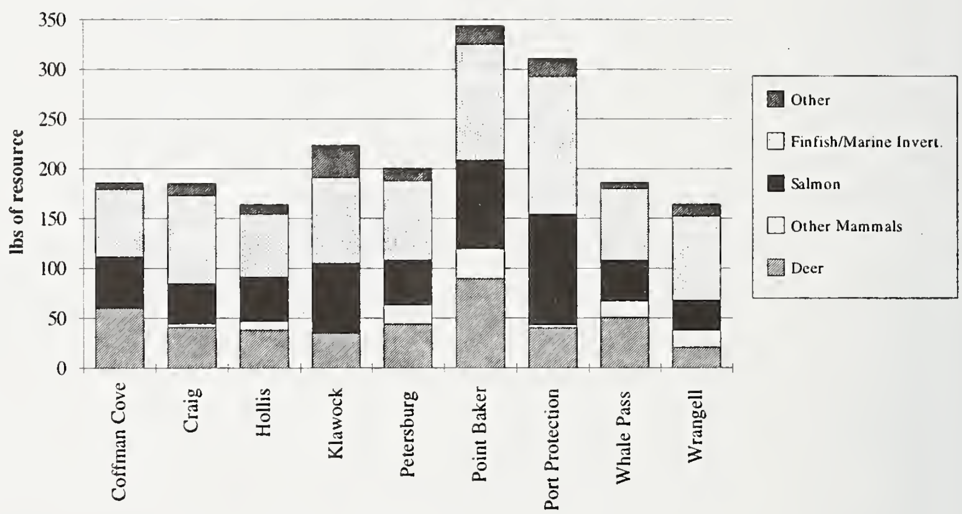
* See preceding text explaining selection of study communities and logging camps.

Table 3-130
Per Capita Subsistence Harvest (Edible Pounds) for Rural Communities, 1987

Community	Deer	Other Mammals	Salmon	Finfish/Marine Invert.	Other	Total
Coffman Cove	59.62	0.00	51.77	67.52	6.82	185.73
Craig	40.61	3.17	40.45	88.64	12.09	184.96
Hollis	37.88	8.70	44.43	62.97	9.93	163.91
Klawock	34.46	1.16	69.39	85.76	32.57	223.34
Labouchere Bay	NA	NA	NA	NA	NA	NA
Naukati Camp	NA	NA	NA	NA	NA	NA
Petersburg	43.93	18.93	45.30	79.37	12.76	200.29
Point Baker	89.14	30.00	89.23	116.46	18.91	343.74
Port Protection	40.00	2.78	111.49	138.15	18.31	310.73
Whale Pass	50.20	16.46	41.10	71.75	6.63	186.14
Wrangell	20.43	16.93	30.21	84.23	12.43	164.23

Source: ADF&G Community Profile Database Catalog, Volume 1: Southeast Region

Figure 3-22B
Community Subsistence Harvest By Resource



Source: ADF&G Community Profile Database Catalog

Lab Bay EIS Subsistence Interviews

As part of the Lab Bay EIS, 77 personal interviews were conducted of a cross-section of Lab Bay subsistence users. The goal of the interviews was not to replicate TRUCS but to supplement it with additional site-specific information and to obtain a more current sense of the subsistence activities occurring since TRUCS was conducted. Active or knowledgeable subsistence users were identified in the communities. Interviews were conducted to establish where they hunted, how much was harvested and which areas informants felt might be most sensitive to timber

harvest. Because of the small sample size, no statistical comparisons with TRUCS can be drawn and the sample is not considered to be statistically representative of subsistence use in the Lab Bay area. The full range of subsistence activities should be represented, however, since we concentrated on the most active subsistence participants.

Of the terrestrial species, only deer has an important consumptive use in the local diet in terms of amount. Other resources may have special cultural significance, but in terms of consumption are relatively minor. In terms of potential measurable effects upon subsistence, deer is the most critical resource to be considered. This has also been the emphasis of ADF&G, as deer is the only terrestrial species for which it prepared a "customary and traditional" use determination for Prince of Wales Island and the only one which applied to the study area. Other aspects of what people commonly refer to as "subsistence" (ideology, quality of experience) potentially would be affected by the proposed actions, but ANILCA specifically speaks to the restriction of activities as the decision measure for the evaluation of potential effects.

TRUCS information indicates that the Project Area is widely used for salmon and deer harvest. Salmon are taken off the entire Project Area coast, with concentrations around the communities of Point Baker, Port Protection, and Whale Pass. Only Wrangell demonstrates a use of the entire area, probably related to commercial fishing activity. Deer are hunted throughout the Project Area, most actively along the beach fringe and road corridors; however, the area has enough roads and hunter effort that even most "backcountry" areas receive some use. Community-specific use patterns also differ dramatically, especially in regard to the degree of dependence upon road access versus beach fringe boat access. Community use is described below.

Community Summaries

Coffman Cove

Coffman Cove originated as a floating logging camp in 1956, but has begun to develop a more diversified population and economy. Residents harvest a variety of subsistence resources, documented in the TRUCS (Table 3-130).

According to Coffman Cove residents, most hunt deer in the immediate vicinity of the community, as do many nonlocal hunters. These statements are supported by the ADF&G hunter survey data presented in Appendix J. Taken in conjunction with the TRUCS map for areas ever hunted by Coffman Cove residents (Appendix J), a consistent pattern of use emerges. Most hunting is reported to take place close to roads, and to rely upon motorized access, so WAA's accessible by road, such as 1527 and 1530, have higher reported levels of deer harvest. Even though WAA 1530 is farther from Coffman Cove than WAA 1527, deer are more abundant in WAA 1530 and are harvested more often.

This is the same general pattern recently described by ADF&G (1992 draft). Access to most hunting areas is by road, although due to the increased use of the near-road areas by nonresident hunters, Coffman Cove residents now tend to hike further away from the roads to hunt. Boats or skiffs are seldom used for deer hunting. No local shortage of deer is noted.

Of the total Coffman Cove 1987 subsistence fish harvest, 90.5 percent was taken by rod and reel, 8.5 percent by commercial gear, and less than 1 percent by noncommercial gear. Because of this pattern, and the Forest Service standards and guidelines which mitigate potential effects of logging activities on fish-bearing streams, the primary subsistence concern for Coffman Cove is deer.

Craig

Craig is perhaps the most diversified community on Prince of Wales Island, and along with Klawock, constitutes the governmental and commercial center of the island. It is connected by paved roads to Klawock and the ferry terminal in Hollis. Craig is serviced by daily floatplanes, the nearby Klawock airstrip, and good harbor facilities.

Craig residents harvest a significant amount and number of subsistence resources, documented by TRUCS and ADF&G. The community has a land use pattern that is clearly different from

that of Klawock, despite the close proximity, some similar history, and some common characteristics. Fish comprise over 50 percent of the edible harvest and deer are the principle source of meat. Rod and reel were used to catch 55 percent of Craig's salmon and 52 percent of nonsalmon fish. Noncommercial gear caught 29 percent of the salmon and 37 percent of the nonsalmon. Commercial gear caught only 16 percent of subsistence salmon and 11 percent of subsistence nonsalmon (ADF&G 1992: Community Profile Database).

Since Craig is a relatively large community, even a low percentage of use represents a substantial number of individuals. TRUCS data (Appendix J) indicates heavy use by Craig hunters of the road corridor through WAA's 1527 and 1530, even though WAA 1529 is where most Craig hunters take deer in the study area. ADF&G deer harvest information (See Appendix J) indicates that Craig hunters are road-access oriented, at least for deer hunting.

Craik Logging

As a subcontractor to KPC, Craik Logging harvests timber, transports it to a landing, and places it in the water. The Craik Logging floating camp operated in the Calder Bay area, within the Lab Bay Project Area from 1992 through 1994. While in the Lab Bay Project Area, Craik Logging was connected to the Prince of Wales road network, but only via a very rough section of road. The camp was serviced by floatplane and could be reached by boat.

Since Craik Logging was in the Project Area for a short time, there is no documented record of any subsistence activity by its residents. Interviews were conducted soon after they arrived in Calder Bay. It is likely that the camp increased localized subsistence resource harvest, and in order to estimate the magnitude of this effect, the pattern of subsistence use by Craik Logging residents during the three years they were located in Margarita Bay is examined here.

Most, if not all, families own boats for transportation, recreation, hunting and fishing. Most hunting occurred on or near roads where timber was being harvested, although occasionally boats are used for hunting. Most fishing is with rod and reel, so while Craik Logging residents harvested a significant amount of fish, the level of use was generally lower than for other communities in the study area. ADF&G hunter surveys from 1987-1991 for the Margarita Bay area reflects limited deer harvest prior to 1989, with a significant increase during 1989-1991. Informants from Craik Logging recollected that hunters from the camp took a total of 25 to 30 deer a year while in Margarita Bay, their previous location, and this is a reasonable estimate of community demand and use. Most current Craik Logging hunting activity was reported to be in WAA 1527. If deer were scarce there, WAA 1526 (outside of the Project Area) was considered the closest alternative. WAA's 1530 and 1529 (within the Project Area) have relatively high deer populations, but are difficult to reach due to poor road conditions.

Craik Logging is included in this description and analysis, even through it no longer operates within the Project Area, because if timber is released through this sale, KPC has indicated that it may be harvested by an operator such as Craik Logging. The location of such a camp could be in a number of places (Calder Bay, Labouchere Bay, etc.), so the affected area cannot be predicted.

Subsistence resources would be affected not only by the change of habitat due to timber harvest, but also by short-term increase in consumptive demand due to the presence of the harvesters. This increased demand may be less for operations such as Craik Logging than for more permanent or established camps such as Labouchere Bay.

Hollis

Hollis, located in eastern Prince of Wales Island, is the site of the only ferry terminal on the island, connecting it (and the Prince of Wales Island road network) to the Alaska Marine Highway system. It is also served by floatplane.

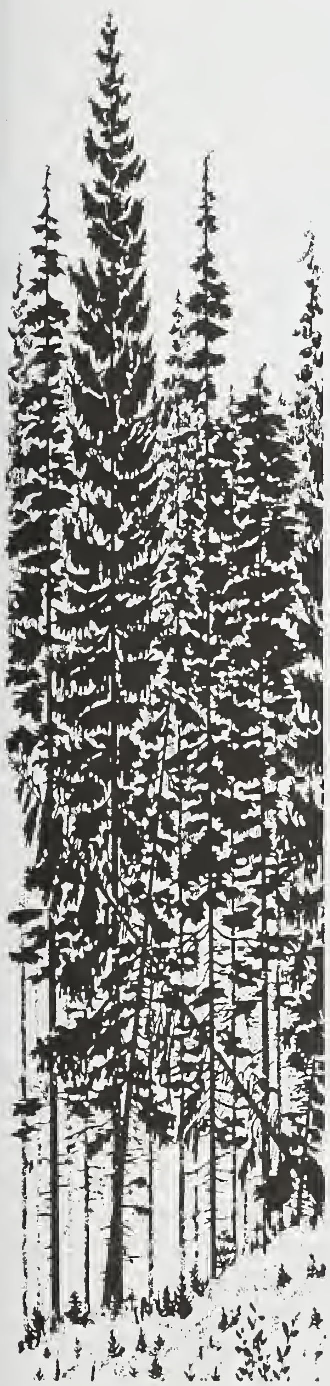
Hollis residents harvest a variety of subsistence resources, documented in most detail through the TRUCS of 1987. Fish constituted 57 percent of the 1987 total harvest, deer 23 percent, invertebrates 16 percent, mammals other than deer 5 percent, and other resources 6 percent.

Salmon is an important subsistence resource (Table 3-130), but Hollis residents do not fish in the Project Area.

Hollis deer hunters prefer their local area. The TRUCS map (Appendix J) and the ADF&G deer harvest statistics indicate that only a few Hollis residents hunt in the Lab Bay study area, and they concentrate on the road corridors. Those interviewed expressed a preference for hunting on foot, often in alpine regions in reasonable proximity to a road to facilitate packing and hauling meat.

Ketchikan

Ketchikan is an urban community with a very diverse economy. Under federal law, its residents are nonsubsistence hunters. Because Ketchikan's harvest of deer in the Project Area is large relative to that of other communities, it has a large effect on subsistence patterns. Ketchikan hunters report taking 57 percent of their total deer harvest from Prince of Wales Island, with 9 percent coming from the Project Area. As a community, Ketchikan has taken an average of 30 percent of all deer reported from the study area. If the proposed action results in a situation where there are not enough deer to satisfy all user groups, ANILCA mandates that subsistence hunters be given a priority over nonsubsistence (Ketchikan) hunters. Potential effects on Ketchikan hunters are not the focus of this analysis under the terms of ANILCA, but potential competitive problems created or exacerbated by the proposed actions are discussed.



Harvest composition information comparable to that for rural communities is not available for Ketchikan, as it was not included in TRUCS. The primary source of information is the series of hunter interviews conducted for this project and ADF&G harvest data. The pattern of deer harvest within the study area by Ketchikan residents is shown in Appendix J-5.

The relation between road access and deer harvested by Ketchikan hunters is significant. The only entry for cars and trucks to Prince of Wales Island is the ferry terminal at Hollis. The ADF&G harvest data indicate that WAA's between the Hollis ferry terminal and the Lab Bay study area have been, in general, more heavily harvested by Ketchikan hunters than have those of the study area.

WAA 1530, the most road-accessible of the four study area WAA's and an area with an historically abundant deer population, has 39 percent of its harvested deer taken by Ketchikan hunters. WAA's 1529 and 1527 both have 27 percent of their harvested deer taken by Ketchikan hunters. WAA 1529 is well-accessed by roads and historically has supported an abundant population of deer, but is the northern-most WAA on Prince of Wales Island. WAA 1527 has relatively few deer, but is the corridor through which the other two WAA's are reached. Ketchikan hunters harvest only 4 percent of the deer taken in WAA 1528, which has no road access.

Clearly Prince of Wales Island is important as a harvest area for Ketchikan hunters. The relatively good quality of the road network, the availability of services in Whale Pass and Coffman Cove, reliable and regular ferry service, and continued logging that produces new productive deer browse in proximity to roads make this pattern possible.

Klawock

Klawock maintains a strong Native identity, tracing a long cultural continuity with the Tlingit villages that have existed at the mouth of the Klawock River since well before the first contact with Euroamericans. Klawock, along with Craig, is developing into the commercial and service center of Prince of Wales Island, primarily because of its location on the transportation network.

Klawock residents harvest a variety of subsistence resources, documented in most detail through the TRUCS and Ellanna and Sherrod (1987). In terms of edible harvest, fish constituted 57 percent of the 1987 total harvest, deer 15 percent, invertebrates 13 percent, mammals other than deer 0.5 percent, and other resources 15 percent. Salmon is an important subsistence resource, but Klawock residents fish in their immediate area rather than using the Lab Bay Project Area. Thus the primary subsistence resource of potential concern in this analysis for Klawock is deer.

Of the communities considered in detail in this report, Klawock is the only one with a predominately Native population (54 percent), and it has a somewhat different history of subsistence use than the other communities. In hearings held in the 1940s to evaluate Native claims to land in southeast Alaska, Klawock residents claimed lands in the immediate vicinity of the village as well as village and home sites as far as the Project Area (Ickes 1945). Under ANCSA, the Klawock Village Native Corporation selected title only to lands in the vicinity of the community. The Project Area is the limit of Klawock's traditional territory and is the area in which use has decreased most over time.

The principle means of transportation for subsistence continues to evolve. As recently as 1982, 67 percent of Klawock hunters harvested deer exclusively from boats, whereas in 1984 only 9 percent did. Hunters exclusively using cars or trucks went from 5 percent in 1982 to 62 percent in 1984. Thus, by 1984 the Klawock deer harvest had switched from a coastal-skiff to an interior-road pattern, as a result of the access provided by logging roads and the competition for resources closer to the village (Ellanna and Sherrod 1987). An examination of the TRUCS land use map (Appendix J) and the ADF&G deer harvest statistics indicates that most of this use is south of the Lab Bay Project Area. The closer an area is to Klawock, the more deer Klawock hunters harvest there.

The ADF&G hunter survey information for 1988-1991 shows that the study area is used by Klawock residents on a regular basis, but not at a high level. Klawock hunters harvest a significant percentage of the deer taken from each of the study area WAA's, except for WAA 1530. In terms of absolute numbers, this is actually relatively few deer for WAA's 1527 and 1528, since only 35 to 43 deer are taken by all hunters from each of those areas each year.

Labouchere Bay

The logging camp at Labouchere Bay, near Port Protection and Point Baker, operated from the late 1970's until 1994. Due to the lack of available timber in the area, the camp was deactivated and most buildings moved to Naukati or other locations. KPC retains the right to use this site for future logging camps, if and when more timber is released in the area. There are no plans for any private land disposal, so it is unlikely that a permanent community will develop at Labouchere Bay. The site is connected to the Prince of Wales road network, and has been serviced by float plane in the past. It can also be reached by boat. Labouchere Bay is a primary access site for residents of Point Baker and Port Protection, who park their vehicles there and reach their homes by boat.

Little documented information exists about Labouchere Bay, since it was never considered a "permanent" community and thus was not included in the TRUCS. Local informants did agree on a general subsistence pattern. Most residents were long-term employees and thus were considered rural Alaskan residents and qualified Federal subsistence users. Residents were avid hunters and fishermen, fishing primarily with rod and reel. Harvest figures are not available, although take is thought to be significant. Hunters most typically sought deer, but bear and other species were also hunted.

Almost all reported deer harvest by residents occurred in the area immediately surrounding the camp, mostly along the roads. Company rules prohibited shooting within one mile of the camp, but most informants reported little difficulty locating a deer to shoot beyond that limit. Estimates of the number of hunters in the camp and the total number of deer taken in a typical year varied widely. Local estimates ranged from 20 to 50 local hunters taking 150 to 200 deer a year, which agreed with Point Baker and Port Protection perceptions as well. ADF&G harvest survey statistics indicate an annual reported Labouchere Bay deer harvest of about 38 animals.

Labouchere Bay informants did not perceive conflicts between logging and subsistence activities. This could be attributed to their direct reliance upon logging for employment. While Labouchere Bay may be used as a camp again in the future, it is unlikely that it would ever be as large as in the past, and would be more bunkhouse rather than family oriented (personal communication, KPC). If timber is released in the Lab Bay area, however, some base of operations would be required and Labouchere Bay would be a logical site. Thus, the historical presence of

a logging operation at Labouchere Bay can be used as an indicator of the likely pattern of subsistence resource use by such a population.

Naukati

Naukati, located on the west side of Prince of Wales Island, has been the site of a log transfer facility and logging camp for many years. Since 1990, when the State of Alaska conducted a land sale, there has been a small permanent community in Naukati in addition to the logging camp. Naukati's location on central Prince of Wales road network favors its continued existence as both a logging camp and permanent community. It is serviced by floatplane and can be reached by boat. A central concern of Naukati camp residents is improved road access — principally a "bypass" road from El Capitan to the Calder area and the Calder Tie road connecting Calder to areas to the north.

Subsistence use patterns for Naukati are not well documented, as it was not included in the TRUCS. Field work for this EIS and ADF&G harvest statistics provided the following description. Naukati residents catch a substantial amount of fish, mostly with rod and reel. Fish appear to be as important as deer in terms of edible harvest. Most deer hunting occurs in the immediate vicinity of Naukati or south towards Winter Harbor. While hunting near the roads is productive, almost all Naukati hunters use the roads to access other good hunting areas. Informants estimate that there are 50 active hunters in Naukati with an annual community take of about 100 deer. ADF&G harvest statistics supports the pattern described by local informants, except that the reported take of deer is much lower. Which figure best represents the actual community harvest is not known. It is fairly certain that few Naukati hunters harvest deer from the Lab Bay Project Area; rather, most deer are taken from the WAA's immediately surrounding the community. As community development continues, there is the possibility of increased use of the Lab Bay Project Area for deer hunting.

It has been reported that a number of the people who formerly worked out of the logging camp at Labouchere Bay have relocated to Naukati (personal communication, KPC). It is not known if this has resulted in an increase in size in Naukati, or if the natural turnover in the Naukati workforce accommodated this dynamic. It is also not known what effect this has had on the pattern of subsistence use of Naukati residents. Before the Labouchere Bay camp closed, few Naukati resident reported using the Project Area for hunting. Because a significant part of the Naukati workforce is now familiar with the Project Area, they may be inclined to make this trip. On the other hand, as residents of the Labouchere Bay camp, they hunted close to the roads and as near the camp as possible, so that they may have adopted the use patterns of longer-term Naukati residents.

Petersburg

Petersburg is located on Mitkof Island about 45 miles northwest of the Project Area. Petersburg is a moderately-sized city with no road connections to other communities, but has daily air service and is a regular stop on the Alaska Marine Highway.

Petersburg residents harvest a variety of subsistence resources. In terms of edible harvest, fish constituted 55 percent of the 1987 total harvest, deer 22 percent, invertebrates 17 percent, mammals other than deer 10 percent, and other resources 6 percent. Most of their fish is taken well away from the Project Area, although some waters near the project are used, and are recognized subsistence areas for Petersburg residents. Since the principal method of harvest is rod and reel, and the Forest Service standards and guidelines mitigate potential effects of logging activities on fish streams, fish will not be considered further in this report. The primary subsistence resource considered in this analysis for Petersburg is deer.

The TRUCS map (Appendix J) indicates that Petersburg residents report having used a substantial portion of the Project Area for hunting deer at one time or another. Although the Petersburg harvest is a significant part of the total harvest from Project Area WAA's, it is a marginal or opportunistic use area for most Petersburg hunters. The Project Area provided an average of only 4 percent of Petersburg's deer for 1988-1991, but 1990 and 1991 was 2 percent as compared

to 5 and 6 percent for 1988 and 1989. Statistics indicate that Petersburg hunters use Prince of Wales Island only when there is no closer or more convenient area to hunt.

Point Baker

Point Baker is an unincorporated community located on the northern tip of Prince of Wales Island. It is a dispersed community, spread along the shores of False Island, the mainland, and surrounding smaller islands. A boat is essential for travel within and beyond the community, as there is no road access to Point Baker. Many residents use the road system by taking a skiff to Labouchere Bay, which is road-connected. Floatplanes regularly service the community.

Point Baker residents harvest a variety of subsistence resources, documented through the TRUCS. In terms of edible harvest, fish constituted 45 percent of the 1987 total harvest, deer 27 percent, invertebrates 14 percent, mammals other than deer 9 percent, and other resources 5 percent. Of the total Point Baker 1987 subsistence fish harvest, 56 percent was taken with commercial gear, 25 percent by rod and reel, and 19 percent by noncommercial gear. Commercial fishing households in Point Baker have larger subsistence resource harvests than do noncommercial fishing households. These households tend to own larger boats, more equipment, and have gained the necessary knowledge of the resources.

Point Baker residents are concerned about the potential effects of logging activities upon commercial and subsistence fishing. Within the scope of this evaluation, Forest Service standards and guidelines will be incorporated into any harvest activity, mitigating the potential affects on fish-bearing streams. The principal terrestrial subsistence resource potentially affected by timber harvest is deer.

Most Point Baker hunters use skiffs or boats on the north coast of Prince of Wales Island, relatively close to the community. Eighty-two percent of Point Baker's deer harvest comes from within the Project Area. The core Point Baker deer hunting area is the northern part of Prince of Wales Island, between the beach and Road 20. Other important areas are the Calder-Holbrook area south of Point Baker/Port Protection, the El Capitan Passage, and a number of other shorelines. These more distant areas are strongly weather dependent, since hunters rely on small boats for transportation. The TRUCS map (Figure 3-23) highlights beach areas that are easily accessible by boat, in a pattern strikingly different from that for the road-connected communities. Point Baker hunters historically have harvested most of their deer in WAA 1529, which surrounds Point Baker and includes the northern coast of Prince of Wales Island (ADF&G 1992; and Galginaitis 1993).

Access is a central concern for Point Baker residents who wish to maintain their use of the most productive and easily accessible hunting areas, while discouraging use by nonlocal hunters. For the most part, Point Baker residents use boats to access the beach fringe, and logging reportedly has made a significant portion of this area impenetrable. Those who use roads to hunt deer, on the other hand, gain from the construction of roads.

Port Protection

Port Protection shares its history and many community characteristics with Point Baker, which is 2.2 miles away by water. It too is a dispersed community and is not road-connected. Many residents use the road system by taking a skiff to Labouchere Bay. Port Protection is serviced by floatplane.

Port Protection residents harvest a variety of subsistence resources, documented in most detail through the TRUCS. In terms of edible harvest, fish constituted 65 percent of the 1987 total harvest, deer 14 percent, invertebrates 15 percent, mammals other than deer 1 percent, and other resources 6 percent. Salmon made up about 55 percent of the total Port Protection 1987 subsistence fish harvest, 54 percent of which was caught with commercial gear. Salmon are an important subsistence resource. Residents fish predominately in local waters, and are concerned with the potential effects that logging may have on fish populations, specifically increased sedimentation and siltation in streams, and higher water temperatures in streams due to the removal of adjacent trees. Since Forest Service standards and guides address these concerns and mitigate potential effects of logging activities on fish-bearing streams, this report does not focus on these

Figure 3-23
Point Baker TRUCS Map

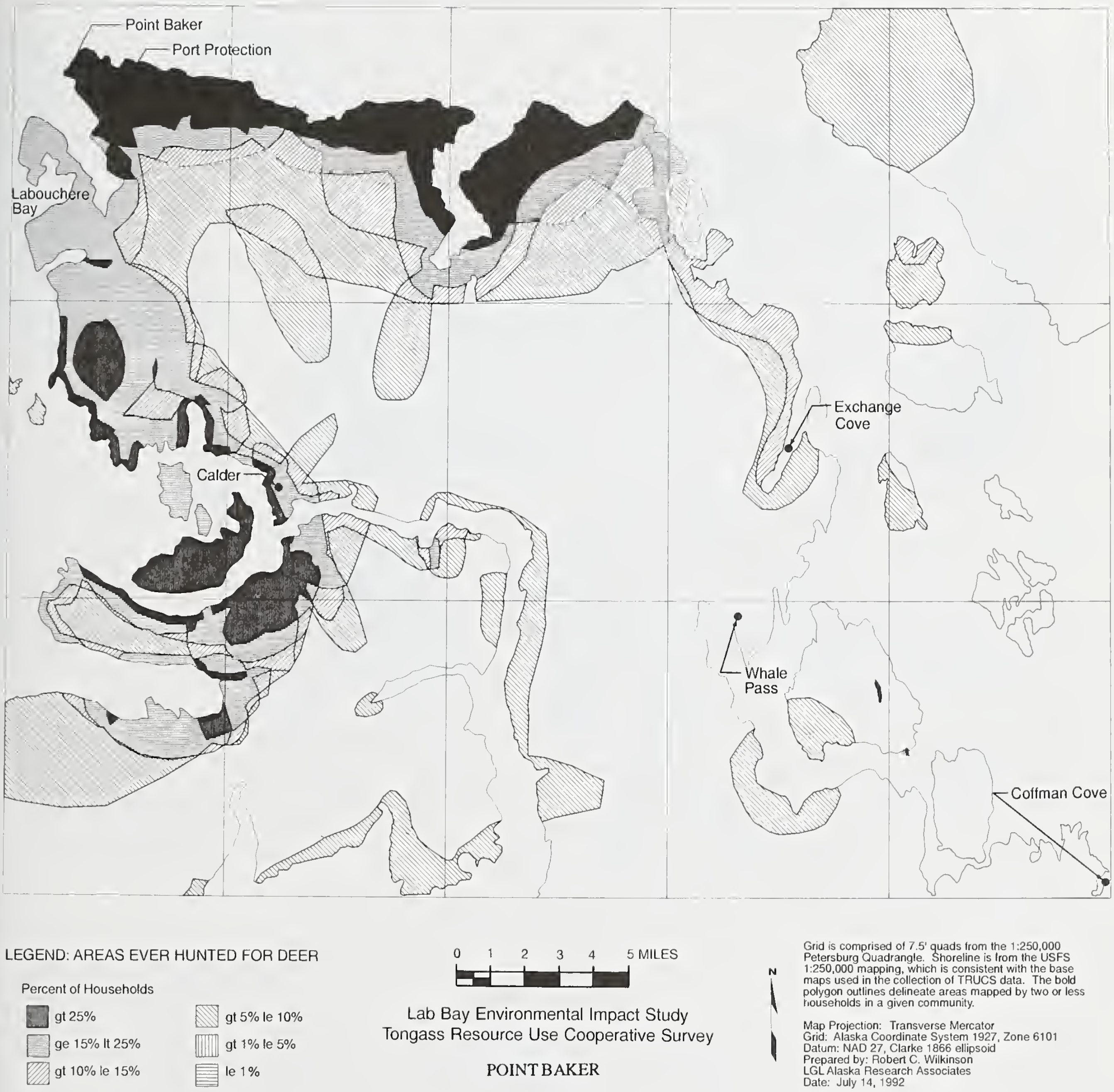


Figure 3-24
Port Protection TRUCS Map

resources. Thus the primary subsistence resource of concern for Port Protection in this evaluation is deer, the main source of meat for the community.

ADF&G harvest statistics indicate that 100 percent of the deer that Port Protection residents report taking come from WAA 1529, the area immediately around Port Protection and Point Baker. Port Protection residents interviewed in 1992 reported hunting outside of the Project Area, which either reflects a change in hunting patterns or that fewer people report their harvest activities to ADF&G than in other communities.

Use beyond WAA 1529 is supported by the TRUCS map (Figure 3-24). Most hunting is reported to take place in or near the beach fringe, which is accessed by boat and often combined with fishing activities. Logging roads are used to a limited extent, especially those accessible from the beaches. Other important areas are the Calder-Holbrook area south of Port Protection/Port Protection, the El Capitan Passage, and other nearby shorelines. Use of more distant areas is strongly weather dependent.

Access is a concern to Port Protection residents who wish to preserve the most productive and easily accessible hunting areas for themselves, while discouraging use by nonlocal hunters. Port Protection residents largely use boats to gain access to deer through the beach fringe, and logging reportedly has made a significant portion of this area impenetrable. Those who use roads to access deer, on the other hand, gain from the construction of roads. This is supported by the ADF&G harvest statistics for Ketchikan, Klawock, Craig, and other road-connected communities.

Whale Pass

Whale Pass is a relatively dispersed community on the northeast coast of Prince of Wales Island. It is connected to the Island road system, is serviced by floatplane, and can be reached by boat.

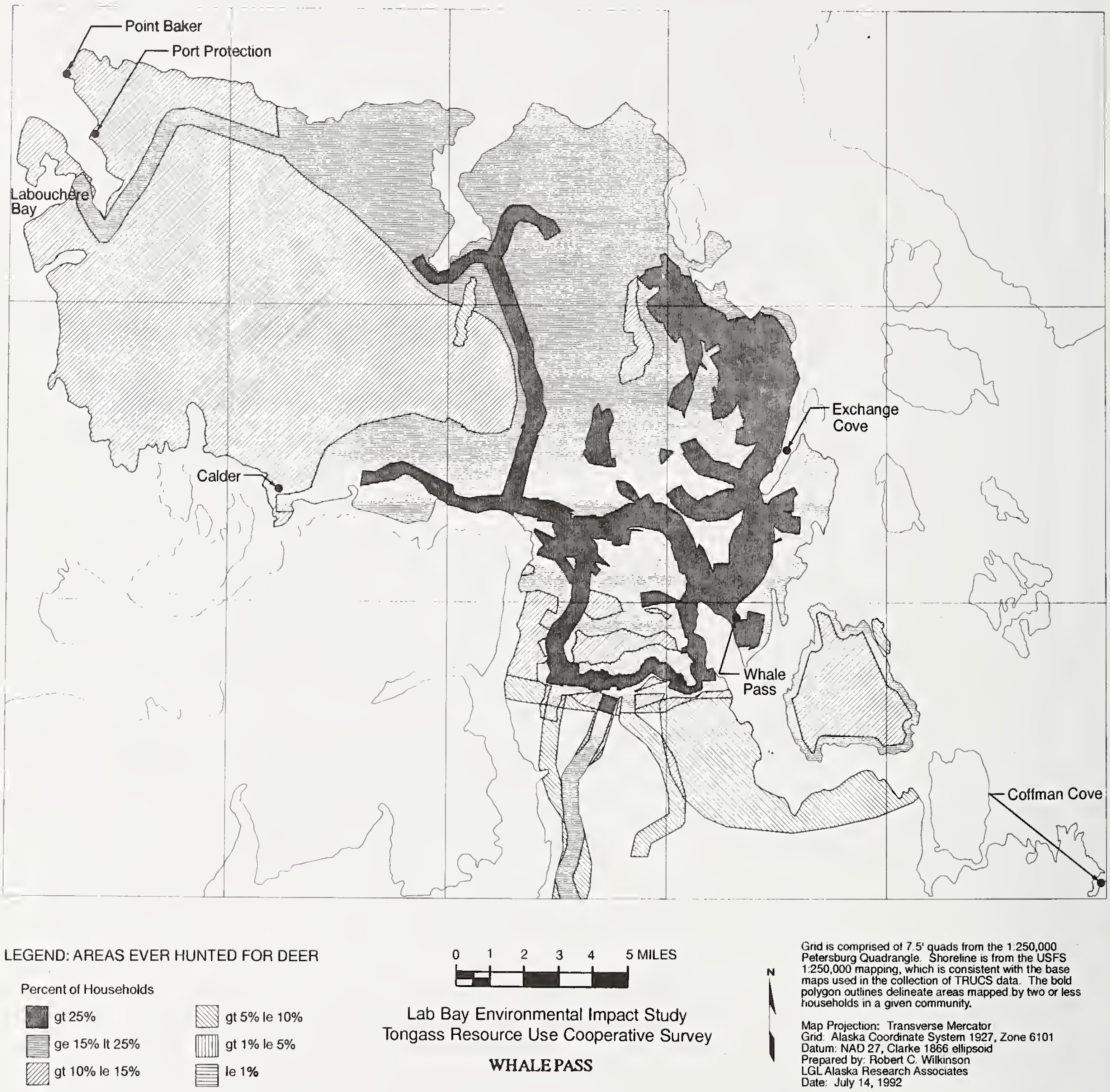
Whale Pass residents harvest a variety of subsistence resources, documented in most detail through the TRUCS. Fish constituted 42 percent of the 1987 total edible harvest, deer 27 percent, invertebrates 18 percent, mammals other than deer 9 percent, and other resources 3 percent. Of the total Whale Pass 1987 subsistence fish harvest, 98 percent was taken by rod and reel, and 2 percent by commercial gear, predominately from local waters. Because Forest Service standards and guidelines mitigate potential effects of logging activities on fish-bearing streams, this report does not focus on these resources. The subsistence resource of potential concern for this evaluation is deer, the main source of harvested meat for the community.

Whale Pass deer hunters extensively use the Project Area (See Figure 3-25) around their community. While roads are important for a large number of Whale Pass hunters, boat and foot access continues to be a mainstay of the Whale Pass subsistence use pattern. A significant portion of hunters use alpine areas and other locations more distant from roads. Because of extensive logging in the Whale Pass area, some alpine locations are now accessible by road.

Sixty-four percent of deer taken by Whale Pass hunters are harvested in the Project Area, with most of this coming from WAA 1530. Community deer harvest outside of the Project Area has varied greatly in terms of location and number. Access to other consistently used areas has been by road and/or boat.

Whale Pass informants were vocal about their perceptions of local subsistence hunting patterns and the effects of logging activities; however, there is no community consensus on these issues (see Planning Record). Most Whale Pass hunters will drive to hunt deer if it means that ultimately there will be less walking involved. A limited number of hunters will make the opposite trade-off, being willing to walk more in an area where there are fewer people (and possibly fewer deer). The Calder/Holbrook area is used by a substantial number of Whale Pass hunters. Informants have noted an increase in the use of this relatively remote area by hunters from outside of the Whale Pass area. WAA 1530, the immediate area around Whale Pass, is still the most productive community hunting area.

Figure 3-25
Whale Pass TRUCS Map



Wrangell

Wrangell, on the northern tip of Wrangell Island, lies approximately 35 air miles northeast of the Project Area. Wrangell is a regional hub with a limited local road network, an airport with daily jet service, floatplane service and ferry service on the Alaska Marine Highway.

Wrangell residents harvest a variety of subsistence resources, documented in most detail through the TRUCS. In terms of edible harvest, fish constituted 45 percent of the 1987 total harvest, deer 12 percent, invertebrates 25 percent, mammals other than deer 10 percent, and other resources 8 percent.

Subsistence use is documented on the TRUCS map (Appendix J). Wrangell's reported harvest from the Project Area increased from 1988 to 1990, then dropped to zero in 1991. This corresponded to a sharp increase in harvest from Zarembo Island.

Residents of communities within the Project Area report that Wrangell hunters access the Project Area mostly by boat, and sometimes combine this with motorized transit by bringing four wheelers or meeting local residents with transportation. The local impression is that most of the Wrangell hunting effort is on the beach and coastal areas. ADF&G statistics support this observation. The majority of reported deer harvest is from WAA 1530, the portion of the Project Area closest to Wrangell.

Communities Considered but Excluded from the Study

Six communities—Edna Bay, Hydaburg, Metlakatla, Saxman, Skowl Arm/Polk, and Thorne Bay—were evaluated as potential study communities, but were excluded from this EIS for various reasons. None of these communities had any significant documented harvest of deer from the Project Area, and several reported no harvest. TRUCS data indicates some past use of the Project Area for hunting, but such use is either very low or was determined to be a peripheral use area for that community. The proposed actions within the Project Area thus will not significantly restrict the subsistence activities of these communities (see Subsistence Resource Report for more detail).

Effects of the Alternatives

ANILCA Section 810 Subsistence Evaluation

ANILCA requires that the potential effects of the alternatives on subsistence resources be evaluated. If there is a significant possibility of a significant restriction, the conditions outlined in ANILCA Section 810 must be met before the action could occur.

This process is incorporated into NEPA proceedings in the following way. An alternative that may significantly restrict subsistence activities cannot be implemented until the responsible federal agency: (1) gives notice to the appropriate state agency and local and regional councils established under ANILCA Section 805; (2) gives notice of and conducts hearings in the vicinity of the area involved; and (3) determines that such a significant restriction of subsistence uses is necessary, consistent with sound management principles for the utilization of the public lands; that the proposed activity will involve the minimal amount of public lands necessary to accomplish the purpose of such use; and that reasonable steps will be taken to minimize adverse impacts upon subsistence uses and resources resulting from such action.

Criteria used to evaluate the effects of the proposed alternatives are changes in the abundance and distribution of subsistence resources, changes in access to subsistence resources, and changes in competition from nonsubsistence users for those resources. The evaluation determines whether a significant possibility of a significant restriction in subsistence uses in the Project Area or portions of the Project Area is likely to occur under any of the proposed alternatives. To determine this, the evaluation focuses on the mapped subsistence use areas within the Project Area and considers the availability of subsistence resources in surrounding areas, the cumulative impacts of past and foreseeable future activities on subsistence users and resources, and the potential cultural and socio-economic implications affecting subsistence users.

Labouchere Bay

The evaluation uses information derived from wildlife capability models, ADF&G hunter survey (harvest) data, and mapped land use information. The discussion of abundance, distribution, access, competition, and cumulative effects are treated in more detail for deer than for other resources, primarily because deer is the resource that is both used and which may be affected to a significant degree. Better information is available for deer than for other resources. All resources are discussed in terms of past and present total harvest. Deer are also discussed in terms of individual community harvest.

The Lab Bay Draft EIS presented habitat capability data from models contained in the 1991 TLMP Draft Revision. Habitat capability models are not intended to predict population levels or set bag limits. Their use is intended to give a relative comparison between alternatives of the effects to habitat, not to make projections of actual animal numbers. In keeping with the intended use of the model data, Final EIS tables and figures displaying the habitat capability model results have been modified to show only the relative habitat capability, expressed as a percentage of the 1954 (prior to commercial harvest) capability, and no direct comparison with documented deer harvest is presented.

There is a relatively high risk of error associated with using habitat capability models to predict population availability for subsistence users, rather than as a relative indicator. The recently published 1996 TLMP Draft Revision has discontinued use of habitat capability models, with the exception of a modified deer model. The modified deer model has been analyzed for the Lab Bay Project, and the results are presented in Appendix P. For other species, the TLMP planning team prepared species assessments documenting expected effects of implementation of the proposed revised Forest Plan. Although the assessments were prepared on a Forest-wide, rather than Project-specific basis, they predict effects that are consistent with those described in this EIS for the Lab Bay Project.

This subsistence evaluation considers whether or not there may be a significant restriction of subsistence use. The Alaska Land Use Council's definition of "significantly restrict subsistence use" is one guideline used in the findings. By this definition:

> "A proposed action shall be considered to significantly restrict subsistence uses, if after any modification warranted by consideration of alternatives, conditions, or stipulations, it can be expected to result in a substantial reduction in the opportunity to continue subsistence uses of renewable resources. Reductions in the opportunity to continue subsistence uses generally are caused by: reductions in abundance of, or major redistribution of resources; substantial interference with access; or major increases in the use of those resources by nonrural residents. The responsible line officer must be sensitive to localized, individual restrictions created by any action and make his/her decision after a reasonable analysis of the information available."

The U.S. Court Decision of Record in *Kunaknana v. Watt* provided additional definitions of "significant reduction of subsistence uses" and also is used as a guideline in the findings. The definitions from *Kunaknana v. Watt* include:

> "Significant restrictions are differentiated from insignificant restrictions by a process assessing whether the action undertaken will have no or slight effect as opposed to large or substantial effects."

In further explanation, the Director [BLM] states that no significant restriction results when there would be "no or a slight" reduction in the abundance of harvestable resources and no "occasional" redistribution of these resources. There would be no effect (or slight inconvenience) on the ability of harvesters to reach and use active subsistence harvesting sites; and there would be no substantial increase in competition for harvestable resources, (that is, no substantial increases in hunting by nonrural residents). Conversely, restrictions for subsistence uses would be significant if there were large reductions in the abundance or the major distribution of these resources, substantial interference with access to active subsistence sites, or major increases in hunting demand (competitive effects). In light of this definition, the determination of significant restriction must be made on a reasonable basis, since it must be decided in light of the total

subsistence lands and resources that are available to individuals in surrounding areas living a subsistence lifestyle. This EIS evaluates the availability of subsistence resources in surrounding areas that could be accessed without undue risk or economic hardship to subsistence users.

Deer: Direct, Indirect, and Cumulative Effects

Subsistence Use Areas

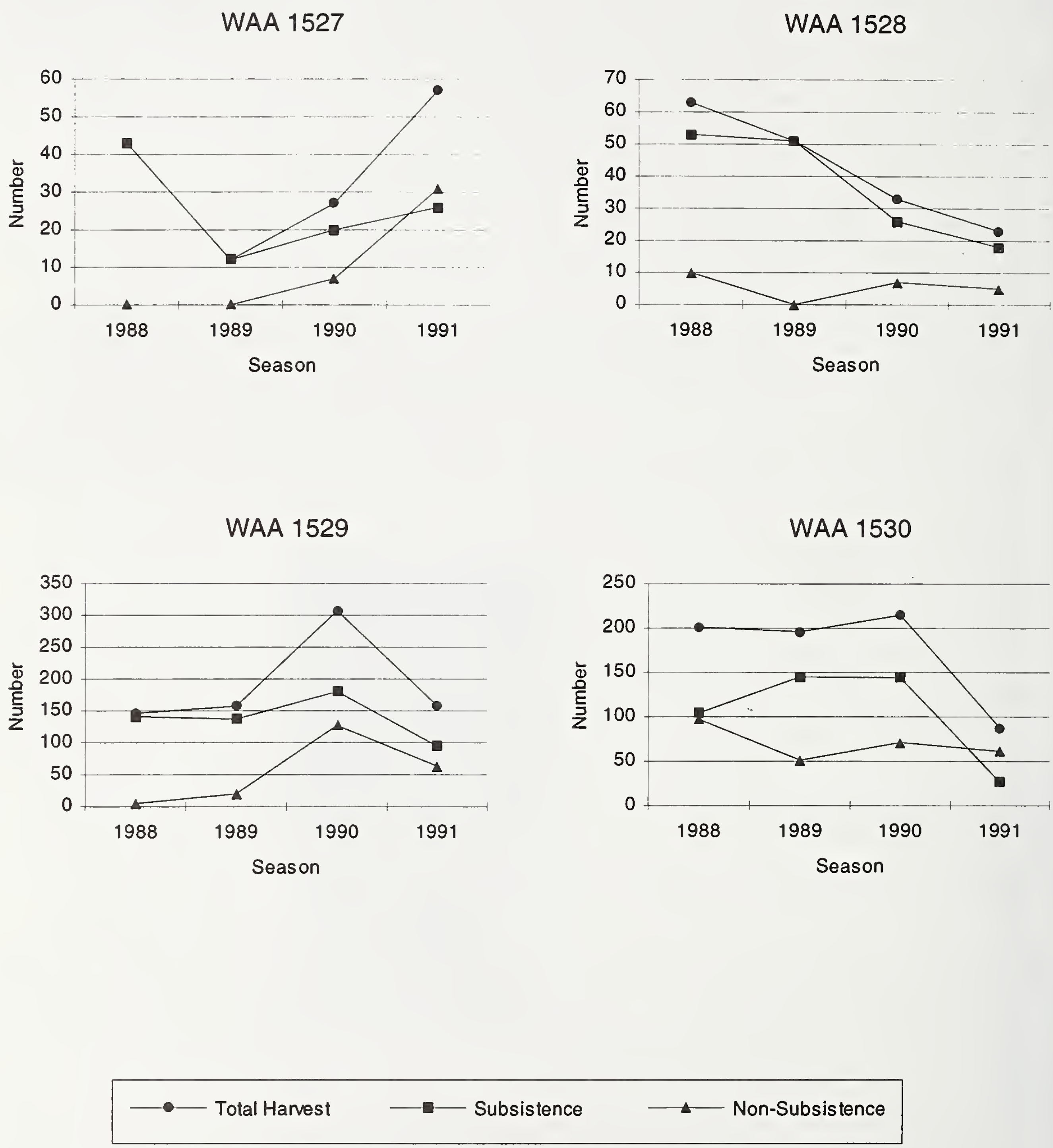
While specific areas within the Lab Bay Project Area are more important than others for harvesting subsistence resources, some degree of hunting use is reported for most of the area. From the TRUCS maps, it is clear that the areas most heavily used to hunt deer are the beach fringe and areas accessible by roads. The relatively developed road network in the Project Area, combined with the preferences of some local hunters for water access and/or nonroaded areas, has promoted this high degree of use. Increased road access is perhaps the most significant factor in increased competition for wildlife resources.

Abundance and Distribution of Deer by WAA

Harvest information has been collected by ADF&G since 1988. The descriptions and tables which follow summarize these data for the four Project Area WAA's. A map of Project Area WAA's is included as Figure 3-11 (Wildlife Section) and the documented level of deer harvest for 1988-1991 in each is graphed in Figure 3-26.

Tables 3-131 and 3-132 present the yearly subsistence and nonsubsistence deer harvest for the Project Area WAA's for 1988-1993. Figure 3-26 presents this information graphically. While most of the subsistence analysis is based on harvest statistics from 1988-1991, these tables incorporate two additional years of information. The pattern is the same, whether one uses data from 1988-1991 or 1988-1991, but the additional two years increases the reliability of the pattern. Nonsubsistence hunters harvested 27 percent of the deer from Project Area WAA's during 1988-1993. This varied from a low of 8 percent in 1992 to a high of 49 percent in 1991. The range of variability for the individual WAA's is even greater.

Figure 3-26
Black-Tailed Deer Harvest



Source: ADF&G

Table 3-131

Summary of Subsistence and NonSubsistence Deer Harvest Lab Bay Project Area, 1988-1993 by WAA

Year		Wildlife Analysis Area 1527	1528	1529	1530	Project Area Total
1988	Subsistence	43	53	141	104	341
	NonSubsistence	0	10	5	97	112
	Total	43	63	146	201	453
1989	Subsistence	12	51	137	140	340
	NonSubsistence	0	0	20	56	76
	Total	12	51	157	196	416
1990	Subsistence	20	26	183	144	373
	NonSubsistence	7	7	127	71	212
	Total	27	33	310	215	585
1991	Subsistence	26	18	94	26	164
	NonSubsistence	31	5	63	61	160
	Total	57	23	157	87	324
1992	Subsistence	32	20	138	140	330
	NonSubsistence	8	10	0	12	30
	Total	40	30	138	152	360
1993	Subsistence	52	36	94	65	247
	NonSubsistence	9	4	44	18	75
	Total	61	40	138	83	322
Average	Subsistence					
		30.8	34.0	131.2	103.2	299.2
Harvest	NonSubsistence	9.2	6.0	43.2	52.5	110.8
	Total	40.0	40.0	174.3	155.7	410.0

Source: ADF&G

This variability may be due to road construction which hindered access to the Project Area (in 1992 especially), or it could be attributed to the perception that there were fewer deer or more hunters in the area. These factors may have encouraged nonsubsistence users to hunt elsewhere.

This information indicates that subsistence deer harvest is less variable than nonsubsistence harvest, with the implication that year-to-year variability in subsistence deer harvest is more predictable than nonsubsistence deer harvest.

Table 3-132

Subsistence and NonSubsistence Deer Harvest as a Percentage of Total Harvest; Lab Bay Project Area, 1988-1993 by WAA

Year		Wildlife Analysis Area 1527	1528	1529	1530	Total
1988	Subsistence	100	84	97	52	75
	NonSubsistence	0	16	3	48	25
	Total	100	100	100	100	100
1989	Subsistence	100	100	87	71	82
	NonSubsistence	0	0	13	29	18
	Total	100	100	100	100	100
1990	Subsistence	74	79	59	67	64
	NonSubsistence	26	21	41	33	36
	Total	100	100	100	100	100
1991	Subsistence	46	78	60	30	51
	NonSubsistence	54	22	40	70	49
	Total	100	100	100	100	100
1992	Subsistence	80	67	100	92	92
	NonSubsistence	20	33	0	8	8
	Total	100	100	100	100	100
1993	Subsistence	85	90	68	78	77
	NonSubsistence	15	10	32	22	23
	Total	100	100	100	100	100
All Years	Subsistence	77	85	75	66	73
Total	NonSubsistence	23	15	25	34	27
	Total	100	100	100	100	100

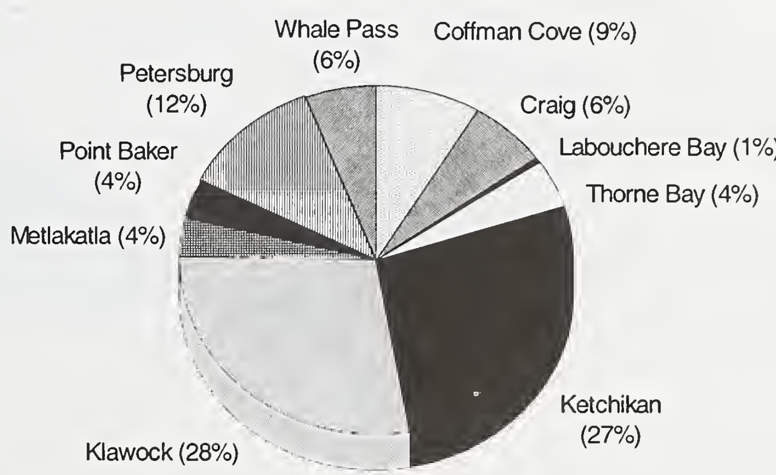
Source: ADF&G

WAA 1527

Part of WAA 1527 is very accessible and much traveled, while the rest is reached by a very rough road and is little used. That portion traversed by Road 20 to El Capitan is hunted opportunistically by those traveling to other parts of the Project Area, and some deer are taken. The portion west of El Capitan has not been hunted much in the past, since road access (Road 15 to Road 29) has been sporadic. Documented harvest levels for WAA 1527 have been the lowest of the Project Area WAA's, and are quite variable. Potential effects of the alternatives upon subsistence users of WAA 1527 are primarily related to increased access.

Those communities which harvest deer from WAA 1527 are identified in Figure 3-27. Most use roads for primary access. The deer harvest from WAA 1527 from 1988-1991 was about 73 percent subsistence and 27 percent nonsubsistence, but was highly variable. In 1991, the nonsubsistence take was over 50 percent. Since WAA 1527 contains approximately 25 percent of the total Project Area habitat, subsistence effects from the proposed action alternatives would be the result of increased access and increased competition. These effects could be significant.

Figure 3-27
Deer Harvest, WAA 1527, 1988-1991*



Source: ADF&G

* 139 deer were reported harvested during this period.

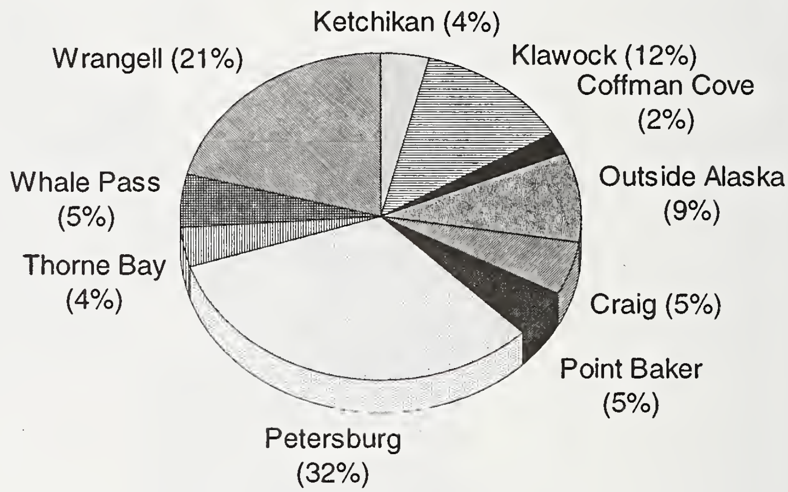
WAA 1528

WAA 1528, an approximately 25,000 acre area, has less road access than other Project Area WAA's. Some deer harvest is reported by people who use boats to access beaches, and either walk in or use small mechanized transport. Increased ease of access due to timber harvest and the construction of additional roads in the area can be expected to increase use and the harvest of deer.

Documented harvest levels for WAA 1528 have been relatively low, and have decreased in recent years. The other three Project Area WAA's all experienced an increase in reported deer harvest between 1989 and 1990. The average annual harvest for WAA 1528 for this period was about 43 deer (10 percent of the Project Area's total).

Those communities which harvest deer from WAA 1528 are indicated in Figure 3-28. For 1988-1991, subsistence hunters harvested 87 percent of the deer taken from this area and nonsubsistence hunters 13 percent. WAA 1528 is used predominately by subsistence hunters, harvesting near or above the current levels, and future timber activities are likely to have significant effect. These effects would result from habitat alteration, as well as access and competition induced by logging roads.

Figure 3-28
Deer Harvest, WAA 1528, 1988-1991*



Source: ADF&G

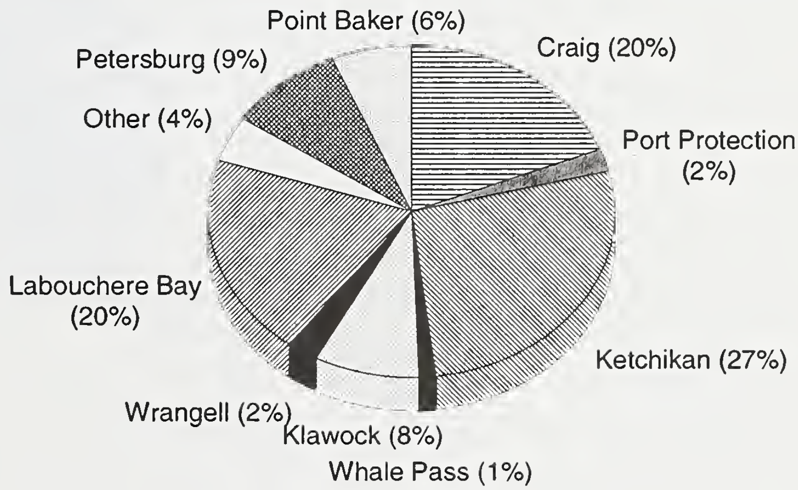
* 170 deer were reported harvested during this period.

WAA 1529

WAA 1529 is the largest of the Project Area WAA's (approximately 72,500 acres) and is one of the most used areas for the harvest of deer. Much of it is road accessible, although the interior is much less so than the coastal areas. The communities of Point Baker and Port Protection are in WAA 1529, as was the former Lab Bay logging camp.

Documented harvest levels for WAA 1529 are the highest in the Project Area, averaging 192 deer a year (43 percent of the average total harvest from the Project Area). For 1988-1991, subsistence users accounted for about 72 percent of the total harvest from the WAA. This percentage has been quite variable. Communities which harvest deer from WAA 1529 are indicated in Figure 3-29. Port Protection reports harvesting 100 percent of its deer from this WAA, Labouchere Bay 92 percent and Point Baker 64 percent, Skowl Arm/Polk 10 percent, Whale Pass, Hollis, Craig, and Klawock each 6 percent. Proposed harvest activities in WAA 1529 would affect deer habitat as well as increasing access and competition.

Figure 3-29
Deer Harvest, WAA 1529, 1988-1991*



Source: ADF&G

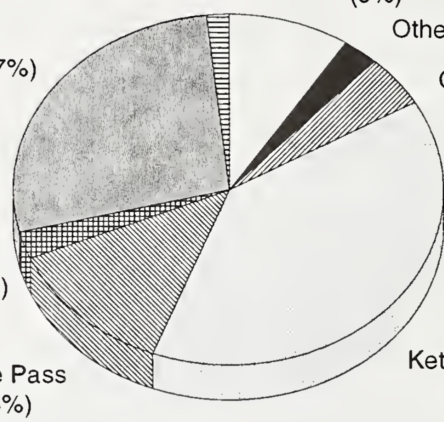
* 767 deer were reported harvested in this period.

WAA 1530

WAA 1530, an approximately 40,700 acre area, has an extensive road network, and is one of the most heavily used areas within the Project Area for the harvest of deer. The community of Whale Pass is in this WAA.

Documented harvest levels for WAA 1530 are relatively high, averaging 175 deer annually (39 percent of the average total harvest from the Project Area). For 1988-1991, subsistence hunters took about 60 percent of the deer harvested in WAA 1530. This varied greatly from year to year. Communities which harvest deer from WAA 1530 are indicated on the pie chart in Figure 3-30. Deer hunters use a combination of road and other access in WAA 1530.

Figure 3-30
Deer Harvest, WAA 1530, 1988-1991*



Source: ADF&G

* 699 deer were reported harvested in this period.

Summary of WAA Effects

The primary information used to assess the effects of each alternative upon deer habitat capability in Project Area WAA's are Habitat Capability Model (HCM) results. This section presents the results of habitat capability modeling for deer using the 1991 TLMP Draft Revision models. Results are expressed as percentage of habitat capability remaining relative to the 1954 condition (prior to commercial harvest). The newly published 1996 TLMP Draft Revision model for deer was also run for the Project Area WAA's (see Appendix P). The results of the new model show similar trends of decreasing habitat capability as those of the 1991 models.

Habitat capability models estimate habitat quality, but do not predict actual population levels. Populations are frequently above or below habitat model predictions at any given point in time for a multitude of reasons including weather, and hunting and trapping pressure. Recently, based on the advice of the Southeast Alaska Regional Subsistence Advisory Council which represents local subsistence users, the Federal Subsistence Board allowed the harvesting of does in addition to bucks after October 1st in the Project Area. This indicates that presently the deer population is adequate to supply subsistence hunters. Wildlife biologists attribute this at least in part to a series of relatively mild winters and increased deer browse from recently harvested clearcuts. Results of models (both 1991 and 1996 deer models) run for the Lab Bay Project show decreasing habitat capability over the long term. It should be noted that changes in weather (such as severe winter snow depths), changes in hunting pressure, or other factors affecting

actual populations can also result in effects to deer populations. These factors are considered by the Federal Subsistence Board in making their determinations.

The action alternatives are nearly equal in their effects on overall Project Area habitat capability. These effects are potentially significant, given the current documented level of deer harvest. Effects which are the same or similar for all action alternatives are discussed together. Differential effects of the action alternatives are also discussed.

Table 3-133 and Figures 3-31A and 3-31B present the information required to begin summarizing the effects of the alternatives. Table 3-133 displays the average documented deer harvest, along with the greatest documented one-year subsistence deer harvest, for each of the Project Area WAA's. Subsistence harvest levels can vary significantly from year to year. Figure 3-31A displays this information graphically and also estimates the projected future demand for deer (discussed below). Figure 3-31B then presents deer HCM results for each of the Project Area WAA's for various years through 2054. Model results for 2054 assume that all suitable and available timber within the Project Area would be harvested by 2054. These results are expressed as the ratio (converted to percentage) of deer Habitat Capability in any given year to deer Habitat Capability computed for 1954.

The Forest Service and ADF&G have agreed upon an estimate for the projected annual increase in the hunter demand for deer of 1.8 percent through the year 2010 and 1.5 percent thereafter. This would result in a 2040 deer demand approximately double that of the present harvest. Also, recent actions of the Federal Subsistence Board may affect deer demand or deer populations — the institution of a "designated hunter" provision in southeast Alaska for deer as well as the provision for a doe hunt on Prince of Wales Island may additionally increase demand for deer or affect the deer population's rate of growth.

Table 3-133
Summary of Documented Deer Harvest by WAA

WAA	Aver. Annual Documented Harvest Rural	Aver. Annual Documented Harvest Total	Max. Subsist. Deer Harvest in 1 Year
1527	25	35	43
1528	37	43	53
1529	139	193	180
1530	104	175	145
Total	**305**	**446**	**421**

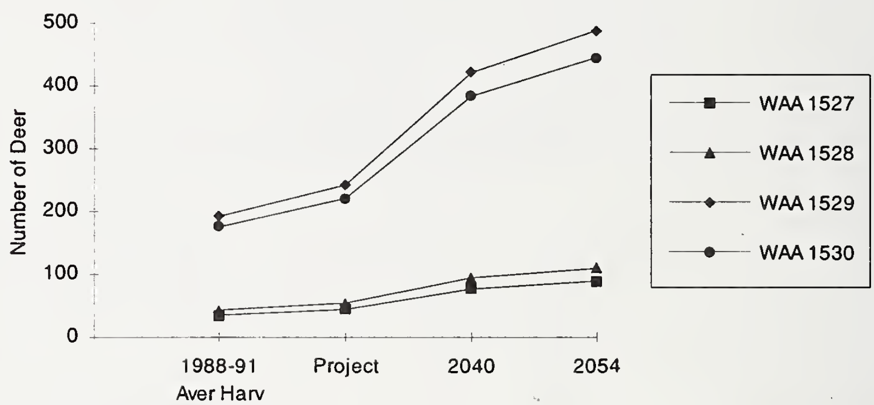
Source: ADF&G 1988-1991 deer harvest statistics.

The habitat capability for WAA 1527 before the proposed action is 85 percent of 1954 deer habitat capability (uncorrected for fragmentation effects), although natural restrictions on access have kept deer harvest levels low. It is thus probable that demand for deer within this WAA is currently being met. If extensive timber harvest occurs in this area, increasing road access west of El Capitan, it is likely that hunter effort would increase. Post-Project deer habitat capability is estimated as 69 percent of the 1954 value (corrected for fragmentation -- the uncorrected percentage is 84 percent). Post-Project cumulative effects are projected to result in a 2040 deer habitat capability that is 58 percent of the 1954 value, and a 2054 deer habitat capability that is 47 percent of the 1954 value (both uncorrected for fragmentation effects). The reduction in habitat capability results from canopy closure occurring on previously harvested areas as well as from projected harvest after the Lab Bay Sale. These dynamics, combined with a possible increase in demand for deer, could have an impact on subsistence users at some point. The ADF&G deer population goal for WAA 1527 is unlikely to be met under any of the alternatives (including

the no-action alternative), since these goals were set as a percentage of (presumed) 1954 deer habitat capability. This is not an effect of the proposed action, since all Project Area WAA's will fail to meet these goals due to the cumulative effects of past harvest activities. Currently, two Project Area WAA's (1528 and 1529) fail to meet these goals, and the other two (1527 and 1530) barely meet these goals -- and would also fall short if fragmentation effects were taken into account.

The current deer habitat capability for WAA 1528 is 84 percent of the 1954 value (uncorrected for fragmentation effects). Post-Project deer habitat capability is estimated as 63 percent of the 1954 value (corrected for fragmentation -- the uncorrected percentage is 83 percent). Post-Project cumulative effects are projected to result in a 2040 deer habitat capability that is 74 percent of the 1954 value, and a 2054 deer habitat capability that is 59 percent of the 1954 value (both uncorrected for fragmentation effects). WAA 1528 currently fails to meet the deer population goal set by ADF&G (set at least 75 percent of 1954 deer habitat capability), so that all alternatives (even the no-action alternative) would fail to meet this goal. This is at least partly due to the small size of WAA 1528 and its lack of deer habitat. Relatively few deer are harvested from this WAA.

Figure 3-31A
Deer Harvest and Projected Demand by WAA



Source: ADF&G 1988-1991 harvest data, TLMP Draft Revision (1991a).

The current deer habitat capability for WAA 1529 is 79 percent of the 1954 value (uncorrected for fragmentation effects). Post-Project deer habitat capability is estimated as 68 percent of the 1954 value (corrected for fragmentation -- the uncorrected percentage is 78 percent). Post-Project cumulative effects are projected to result in a 2040 deer habitat capability that is 51 percent of the 1954 value, and a 2054 deer habitat capability that is 48 percent of the 1954 value (both uncorrected for fragmentation effects). WAA 1529 currently fails to meet the deer population goal set by ADF&G (set at least 75 percent of 1954 deer habitat capability), so that all alternatives (even the no-action alternative) would fail to meet this goal. Given projected increases in demand for deer and the extensive harvest activity that already occurs in this WAA, significant impacts on subsistence users are likely.

Assessing deer habitat capability in WAA 1530 is complicated because about a third of the habitat is contained in the Central Prince of Wales sale area. The current deer habitat capability for WAA 1530 is 72 percent of the 1954 value (uncorrected for fragmentation effects). Post-Project deer habitat capability is estimated as 41 percent of the 1954 value (corrected for fragmentation

Figure 3-31B
Relative Habitat Capability for Deer by WAA

Source: TLMP Draft Revision (1991a) and Project Planning Record

1 Includes portion of WAA's outside the Project Area, but included in the TLMP Draft Revision 1991a HCM numbers. Figures are NOT corrected for fragmentation effects.

2 Most extreme value of the action alternatives, usually the total unit pool. There are minor differences among the alternatives in terms of deer HCM results. These values are NOT corrected for fragmentation effects.

3 Most extreme value of the action alternatives, usually the total unit pool. There are minor differences among the alternatives in terms of deer HCM results. These values ARE corrected for fragmentation effects.

4 Value taken from TLMP 1991a for entire WAA. Does NOT include fragmentation effects, which can be expected to further reduce effective deer habitat capability for Project Area WAA's by about 30 percent (for example, from 58 percent to 41 percent). HCM values for TLMP Draft Revision 1991a and pre-fragmentation Project-specific GIS-generated HCM values are not identical, but are within 6 percent for cumulative effects.

-- the uncorrected percentage is 71 percent). Post-Project cumulative effects are projected to result in a 2040 deer habitat capability that is 54 percent of the 1954 value, and a 2054 deer habitat capability that is 29 percent of the 1954 value (both uncorrected for fragmentation effects). The ADF&G deer population goal for WAA 1530 is unlikely to be met under any of the alternatives (including the no-action alternative), since these goals were set as a percentage of (presumed) 1954 deer habitat capability. Currently, WAA 1530 barely meets this goal -- and would also fall short if fragmentation effects were taken into account. Given projected increases in demand for deer and the extensive harvest activity that already occurs in this WAA, significant impacts on subsistence users are likely.

The general conclusions for all Project Area WAA's are that long-term deer habitat capabilities will decline significantly, demand for deer will increase significantly, and access will likely remain the same or be made easier. These conditions make it possible, and perhaps likely, that there will be a future significant effect upon subsistence users. This possibility is greater, and is likely to occur sooner, in those WAA's that are currently accessible by road (1529, 1530) as opposed to those that are not (1527, 1528). However, WAA 1528 is sensitive to such effects because of other factors -- its relatively small size and limited deer habitat capacity. Even WAA 1527 is likely to exhibit significant effects upon subsistence users by 2054.

Designated hunters have been approved as Federally qualified subsistence hunters in Southeast Alaska. This allows any licensed subsistence hunter to designate any other licensed subsistence hunter to harvest a full limit of four deer on his behalf. A designated hunter may hunt for any number of qualified people. This is in response to a common pattern of a limited number of subsistence hunters in any community taking a relatively large number of deer and sharing them widely within (and beyond) the community. The formal recognition of this through the designated hunter provision may increase the subsistence demand for deer on Prince of Wales Island. It is not possible to project the effects of this upon actual harvest so it has not been factored into the analysis.

The Federal Subsistence Board also has changed the bag limit on Prince of Wales Island to allow the fall harvest of four deer, including one without antlers (either a doe or buck). Previously, the bag limit was four antlered deer. While subsistence users traditionally hunt does, this regulatory change could affect the rate of growth of the deer population on Prince of Wales Island. There has been resistance to doe hunts on Prince of Wales Island in the past, so the effects of this are not clear and were not factored into the analysis.

Community Subsistence Use of Deer

There is no simple way to quantitatively compare the alternatives in terms of their relative subsistence effects. All parts of the Project Area are used by hunters from at least one community, but different areas are more important for different communities. All alternatives, except the No Action Alternative, would significantly restrict subsistence activities in at least some communities in a direct way. Of the action alternatives, Alternative 6 would by far have the least effect upon subsistence. Alternative 3 would have the next least effect. Alternatives 4 and 5 would have lesser effects than Alternative 2, but in terms of subsistence there is no clear choice between the two. Alternative 1, the No Action Alternative, would have the least effect upon the use of subsistence resources. The difference between Alternative 6 and the other action alternatives is far greater than the differences among the other action alternatives.

Community Subsistence Effects Analysis

To examine the effects of the alternatives on community subsistence use, units proposed for harvest were considered in two geographic areas. The northwest use area includes Point Baker and Port Protection, while the southeast use area includes Whale Pass. These communities have most potential to be adversely affected by the proposed action. Table 3-134 summarizes the alternatives in terms of significant components for subsistence use effects analysis. The table differentiates alternatives by specifying the number of units each contains, the number of those units which fall within the community subsistence use areas mapped by TRUCS, and possible "road effects" of such unit.

To assess the effects of each alternative, TRUCS information was used in conjunction with other data to identify parts of the Project Area most critical for each community, the relative size of each community's use area, and each community's pattern of subsistence use. When combined with ADF&G deer harvest statistics, quantitative descriptions can be developed of each community's use area. Since the smallest geographical unit for which harvest statistics are available is the WAA, they are the basis of this description. The term "Main deer harvest WAA's" is used to refer to those WAA's which make up the area from which a community harvests about 90 percent of its deer. "Low deer harvest WAA's" are those from which a community harvests the other 10 percent of its deer. "Core deer harvest WAA's" are a subset of "Main

WAA's," and are those most frequently used by a community to harvest deer. The threshold for inclusion in a group varies for each community. For communities that harvest many deer from different WAA's, the threshold is generally about 3 to 5 percent of their total harvest. For communities with a smaller total deer harvest and a more limited harvest area, threshold can be considerably higher — typically 10 percent, but up to 100 percent of a given community's total harvest. Table 3-135 summarizes this information, displaying how many WAA's are part of each community's "Core," "Main," and "Low" use areas and classifies each community's level of use of Project Area WAA's.

Table 3-134

Summary of Alternative Components Significant for Subsistence Use Effects Analysis

	Number of Units	NW Subsistence Use Area	SE Subsistence Use Area	Road Effects
No-Action	None	None	None	None
Units Common to All Action Alternatives (2-6)	23 units plus Thorne Island[1]	2 units	9 units; plus Thorne Island[1]	Lower N. Salmon Bay Lk Road
Units Not Common to All Action Alternatives				
Alternative 2	84	30	10	Upper N. Salmon Bay Lk Road; East Red Bay Road; West Red Bay Road; Calder Tie Road[2]
Alternative 3	42	13	5	Upper N. Salmon Bay Lk Road; East Red Bay Road
Alternative 4	55	19	10	Upper N. Salmon Bay Lk Road; East Red Bay Road
Alternative 5	44	18	3	Upper N. Salmon Bay Lk Road; East Red Bay Road; West Red Bay Road
Alternative 6	23	4	3	None

[1] Thorne Island harvest is included in all alternatives. For Alternatives 2, 3 and 5, this is a conventional layout with clearcut units, a logging road network, and LTF. Alternative 4 and 6 incorporates an uneven-aged management plan with helicopter logging, no roads and no LTF. Thorne Island is treated as a common element of all alternatives, with the understanding that the uneven-aged management plan is severable from Alternatives 4 and 6, and may be incorporated into another alternative.

[2] The Calder Tie Road is analyzed as part of Alternative 2. It could be a component of any alternative, with the exception of Alternative 6.

"Common Unit" Effects

The full unit pool consists of 125 units, 107 on Prince of Wales Island and 18 on Thorne Island. All action alternatives include 23 "in common" units. All alternatives also include Thorne Isand. For Alternatives 2,3, and 5 a conventional layout is proposed on Thorne Island with a logging road network and LTF. For Alternatives 4 and 6, an uneven-aged management plan is specified for Thorne Island, with helicopter logging, no roads, and no LTF. Since each action alternative includes harvest on Thorne Island, it is treated as a common element of all alternatives.

Other potential common effects upon subsistence resources would result from roads built north of Salmon Bay Lake and the fragmentation of the old-growth habitat link between Red Lake and Salmon Bay Lake (discussed briefly below and in the Wildlife section).

Alternative 2 would have the greatest effect on subsistence resources, encompassing all the effects described as part of the other action alternatives. Thus, its effects are summarized at the end of this subsection. The Calder Tie Road is addressed in the Alternative 2 summary. It is a component of only this alternative; however, it may be incorporated into another option as part of the chosen preferred alternative.

Action Alternatives 3, 4, 5, and 6 consist of Thorne Island plus 65, 78, 67, and 46 Prince of Wales Island units, respectively. Since 23 of these units and Thorne Island are common to all action alternatives, the shared subsistence resource effects are described in the geographic assessment below.

Northwest Subsistence Use Area Units, Road Effects, and Fragmentation Effects. The full unit pool includes 32 units in the northwest subsistence use area, which is approximately depicted as the high-use area in Figure 3-24. There are two commonly shared units in this area (532-219 and 532-220). Unit 532-219 is adjacent to a previously harvested area and unit 532-220, while extending the road network somewhat into a new area, should not have major road effects. As indicated in the Wildlife section, Units 533-248, 533-249, and 534-218 are included in all action alternatives and have the effect of breaking the old-growth forest corridor between Red Lake and Salmon Bay Lake. While these units are not located within mapped high-use subsistence areas for any community, increased fragmentation of old-growth (deer winter habitat) decreases the future population of deer. Some subsistence users have expressed concerns about the habitat integrity of areas that they do not actively use for hunting, citing their utility as "game refuge" or "recharge" areas. Similarly, Units 534-226 and 534-225 in the lower Salmon Bay Lake Road area are shared by all action alternatives and are not located in mapped high-use subsistence areas. However, they are near such areas, are included within less intensively used subsistence areas for several communities, and would extend roads into a previously unroaded area. Improved access may increase competition for deer by attracting more hunters, and may affect the habitat integrity of areas not currently intensely hunted by subsistence users, but perceived as important for other reasons.

Looking South from Road 20, near Lab Bay

Table 3-135
Community Dependence on Project Area for Deer Harvest

Community	Number of WAA's Comprising Area Used for Deer Harvest; % of Harvest from this Area: Core[1]	Main[2]	Low[3]	Community Use of Project Area WAA's: 1527	1528	1529	1530
Coffman Cove	2 (71%)	3 (86%)	9 (14%)	low	low	none	MAIN
Craig	7 (78%)	10 (87%)	14 (13%)	low	low	CORE	low
Hollis	4 (66%)	8 (93%)	3 (7%)	none	none	MAIN	MAIN
Hydaburg	3 (56%)	7 (88%)	4 (12%)	none	none	low	none
Ketchikan	16 (68%)	34 (90%)	36 (10%)	low	low	CORE	CORE
Klawock	4 (75%)	10 (91%)	10 (9%)	MAIN	MAIN	CORE	none
Lab Bay	1 (92%)	1 (92%)	4 (8%)	low	none	CORE	none
Metlakatla	3 (71%)	8 (91%)	5 (9%)	MAIN	none	MAIN	low
Naukati	1 (63%)	3 (90%)	2 (10%)	none	none	none	low
Petersburg	7 (69%)	23 (89%)	33 (11%)	low	MAIN	MAIN	low
Point Baker	1 (64%)	3 (87%)	3 (13%)	low	MAIN	CORE	none
Port Protection	1 (100%)	1 (100%)	0	none	none	CORE	none
Saxman	3 (86%)	3 (86%)	2 (14%)	none	none	none	none
Skowl Arm/Polk	1 (88%)	1 (88%)	3 (12%)	none	none	low	none
Thorne Bay	3 (77%)	5 (90%)	15 (10%)	low	low	low	low
Whale Pass	1 (49%)	8 (91%)	4 (9%)	MAIN	MAIN	MAIN	CORE
Wrangell	7 (72%)	18 (89%)	22 (11%)	none	MAIN	MAIN	CORE

Source: ADF&G Harvest Statistics, 1988-1991

[1] "CORE use" WAA's are those which the community uses most frequently to harvest deer. Threshold values for selection differ for each community (see text).

[2] "MAIN use" WAA's are those from which the community derives about 90% of its total deer harvest.

[3] "LOW use" WAA's are those from which the community derives only about 10% of its total deer harvest.

Southeast Subsistence Use Area Units. There are nine commonly shared units in this area, all in WAA 1530. Unit 539-206 and Units 535-204, -205, -207, -208 and -209 are located inland west of Exchange Cove, north of Whale Pass. Units 540-206, -210 and -224 are west of Exchange Cove. All these units are in the high-use subsistence area for at least one community (Whale Pass), and their harvest would have localized effects. Road effects are expected to be minimal because there is already good access and new roads are to be closed when logging is completed.

Thorne Island, Conventional Harvest. Thorne Island is included in WAA 1530. Although it is a peripheral use area for many communities except Whale Pass, it is important to other communities on an opportunistic basis. Conventional timber harvest on Thorne Island would affect subsistence users by potentially reducing local deer habitat capability in the long term. The road network would potentially increase hunting effort. At present, most hunting effort is concen-

trated on the coast and outer boundaries of the island because it is difficult to penetrate the interior. Once roads are built in the interior, access will be facilitated. Even if these roads are closed to standard vehicles it should be expected that ATV's and motorcycles would be used for hunting. Some users would, of course, welcome this increased access while others would not. Increased access would accelerate the decrease in deer habitat capability, especially in the long term. At a minimum, Whale Pass subsistence hunters could be displaced to other areas (a significant effect), while subsistence users from other communities would adapt to the new conditions. During the period of active logging, traditional use patterns would be temporarily disrupted.

The harvest on Thorne Island would be based out of existing facilities. The local harvest of deer would be expected to increase due to the presence of this work force, but not to a great extent. Logging companies forbid the transportation of firearms in company vehicles, so hunting can take place only during nonwork days. Even though people harvesting timber in the Whale Pass/ Thorne Island area will be more familiar with this area, they are more likely to hunt in areas closer to where they live than to travel a longer distance to the Whale Pass/Thorne Island area. An increase in local hunting effort and harvest is more likely if deer (and other resources) are perceived as more plentiful and available in the Whale Pass/Thorne Island area than in the areas where the workers reside.

Any increased demand and harvest of subsistence resources would exacerbate the potential shortfall of resources during the period of active timber harvest, and probably for at least a transitional period of time afterwards. This increased hunting pressure could disrupt the subsistence pattern for Whale Pass residents, whose "Core" high-use areas consist solely of WAA 1530 (which contains Thorne Island and the area surrounding Whale Pass). Displacement of subsistence hunters to other areas could occur. Although expected to be a temporary affect, it could nonetheless be significant.

Thorne Island, Uneven-aged Management Plan. The uneven-aged harvest management plan proposed in Alternatives 4 and 6 would reduce effects upon subsistence users of Thorne Island. Because no road construction would be required, there would be no increased access effects. Selective harvest could improve deer browse so that habitat capability potentially could increase in the short term (although this assumption has not been modeled). While hunting would be precluded during active logging, especially when helicopters are in use, the effects on subsistence resources would be minimal.

Logging operations would be based at an existing facility with similar effects as discussed above. These effects may be greater since logistical support for helicopters and barges would need to be supplied. The effects on Thorne Island itself would be less, however, since hunting access would still be restricted but would be increased for the rest of WAA 1530.

Alternative 3

Northwest Subsistence Use Area Units and Road Effects. In addition to the commonly shared units, Alternative 3 contains 11 additional units in this area. One unit, 529-270, is unique to Alternative 3. Ten units (529-257, -256, -259, -284, -285, 532-221, -223, -231, 534.1-204, -211) are shared with Alternative 4; seven (528-250, -251, 532-221, -223, -231, 534.1-204, -211) with Alternative 5; and four (528-250, -251, 529-256, -284) with Alternative 6. The units in VCU 534.1 are in WAA 1528, while the others are in WAA 1529. Unit 529-270 is close to Port Protection and Point Baker and is considered a very important subsistence area. Its harvest would increase habitat fragmentation significantly. The harvest of other units in VCUs 528 and 529 also could be detrimental to local communities, but probably no more so that timber harvest elsewhere in their subsistence use area. Three units in VCU 529 are north of Road 20, an area extensively used for subsistence by Point Baker and Port Protection residents. These three units are between the road and areas that have been previously logged, so potential subsistence effects should be incremental.

Further east, the harvest of units in VCU 532 east of Red Bay are in the high-use subsistence area of several communities (TRUCS maps; Table 3-135) in a previously unroaded and unlogged area. Combined with the harvest from units included in all action alternatives, the East Red Bay

Road units could have a significant effect upon subsistence. Direct loss of habitat would reduce the deer capability. Long-term effects would result from increased access. While timber harvest is taking place, road access could be expected to at least temporarily increase hunting effort in the area. Since the roads would be closed once logging is finished, this can be expected to be a temporary effect. Units 534.1-204 and -211 ("upper North Salmon Bay Lake Road," WAA 1528) are the terminal units on a string of units north of Salmon Bay Lake, and extend the road system of a string of units included in all action alternatives ("lower North Salmon Bay Lake Road"). This is not a principal subsistence use area for any single community, but is used by several and is currently unroaded. Timber harvest and road construction in this area would exacerbate the effects described for the lower Salmon Bay Lake Road (above). WAA 1528 is already below the deer habitat capability required to support the average documented deer harvest, as well as below that required to meet the ADF&G deer population goal. Harvesting these units would reduce habitat capability and may increase hunting effort due to increased road access, although the intention is to close this road once timber harvest is finished. Because this new road would provide access to a previously unroaded area, and would almost reach the northern shore, it would be expected to be attractive to hunters. Increased hunting effort while logging occurs is probable. Because of the low habitat capability of this area, it is recommended that any road built in this area be closed when no longer needed for timber harvest.

Southeast Subsistence Use Area Units. Alternative 3 includes 5 units in addition to those commonly shared units. Two are shared with Alternative 6 (539-210 and 540-225) and all are shared with Alternative 4. All are in WAA 1530, close to Whale Pass. None have special significance for subsistence, beyond being in the high-use subsistence area.

Alternative 4

Northwest Subsistence Use Area Units. Alternative 4 incudes 19 units in addition to those commonly shared units. Five units (529-286, 530-200, -203, -240, and -241) are unique to Alternative 4. Ten units (529-257, -256, -259, -284, -285, 532-221, -223, -231, 534.1-204, -211) are shared with Alternative 3 (discussed above), nine (527-224, -227, -228, -229, 532-221, -223, -231, 534.1-204, -211) with Alternative 5, and seven (529-256, -285, 532-221, -223, -231, 534.1-204, -211) with Alternative 6. The units in VCU 534.1 are in WAA 1528, while the others are in WAA 1529. The five units unique to Alternative 4 are all in WAA 1529. Four are north of Road 20, while one is just south of it. Two of those north of Road 20 and the one south of it have no special subsistence concerns, other than being in a high-use subsistence area. The two north of Road 20 are between the road and previously logged areas. Two other units north of Road 20 (529-286 and 530-241), are close to the coast, an area of intensive subsistence use by Point Baker and Port Protection residents. The harvest of other units in VCUs 528 and 529 could also be detrimental to local communities, but probably no more so that timber harvest elsewhere in their subsistence use area. Three units in VCU 529 are north of Road 20, an area extensively used for subsistence by Point Baker and Port Protection residents; however, these units are between the road and areas that have been previously logged, so potential subsistence effects should be incremental. On the other hand, timber harvest from units within VCU 527 could have significant effects. This is a very high-use subsistence area, close to Point Baker and Port Protection, and were among the units about which the most subsistence-related comments were received. Their harvest would affect not only use patterns, but also less tangible (aesthetic, ideological) aspects of subsistence.

Further east, the harvest of units in VCU 532 (WAA 1529) east of Red Bay are in the high-use subsistence area of several communities (TRUCS maps; Table 3-135) in a previously unroaded and unlogged area. Combined with the harvest from units included in all action alternatives, the East Red Bay Road units would have a potentially significant effect upon subsistence. Direct loss of habitat would reduce the deer capability. Long-term effects would result from increased access. While timber harvest is taking place, road access could be expected to temporarily increase hunting effort in the area. Since the roads would be closed once logging is finished, this can be expected to be a temporary effect. Units 534.1-204 and -211 ("upper North Salmon Bay Lake Road," WAA 1528) are the terminal units on a string of units north of Salmon Bay Lake, and extend the road system of a string of units included in all action alternatives ("lower North Salmon Bay Lake Road"). In addition, this alternative includes Unit 534-228, the "base unit"

for the lower North Salmon Bay Lake Road. This is not a principal subsistence use area for any single community, but is used by several and is currently unroaded. Units in this area would exacerbate the effects described for the lower Salmon Bay Lake Road (above). WAA 1528 is already below the deer habitat capability required to support the average documented deer harvest, as well as below that required to meet the ADF&G deer population goal. Harvesting these units would locally reduce habitat capability and may increase hunting effort. The intention is to close this road once timber harvest is finished. Because this new road would provide access to a previously unroaded area, and would almost reach the northern shore, it likely would be attractive to hunters. Increased hunting effort while logging occurs is probable. Because of the low habitat capability of this area, it is recommended that any road built in this area be closed when no longer needed for timber harvest.

Southeast Subsistence Use Area Units. In addition to the commonly shared units, 10 units are identified in Alternative 4. Units 539-215 and 538-223 are unique to Alternative 4; 5 are shared with Alternative 3 (538-208, -210, 539-210, 540-221, -225); 3 units (539-220, -221 and -222) are shared with Alternative 5; and 3 with Alternative 6 (539-210, -222 and 540-225). All are in WAA 1530, near Whale Pass. Those closest to Whale Pass have no special subsistence characteristics other than being in a high-use area. Three units near Exchange Cove (539-220, -221, and -222) have some special subsistence concerns. Local informants report that this is an important hunting area, of which they are more protective than other parts of their "high-use" subsistence area.

Alternative 5

Northwest Subsistence Use Area Units and Road Effects. In addition to the commonly shared units, Alternative 5 contains 18 additional units in this area. Seven units (527-206, -226, 531.1-205, -208, -257, 532-228, 229) are unique to Alternative 5. Seven units (528-250, -251, 532-221, -223, -231, 534.1-204, -211) are shared with Alternative 3 (discussed above), nine (527-224, -227, -228, -229, 532-221, -223, -231, 534.1-204, -211) with Alternative 4, and two (528-250, -251) with Alternative 6. The units in VCU 534.1 are in WAA 1528, while the others are in WAA 1529. Four of the unique units are in WAA 1529. Units 527-206 and -226 are in the high-use subsistence area for Point Baker and Port Protection. They are also very close to the communities and are used for a variety of other activities. They are the two units about which the most comments were received. Units 532-228 and -229 are more distant from the communities, but are in their high-use subsistence area and would extend a road into a previously unroaded area, close to the coast to the west of Red Bay ("West Red Bay Road"). The timber in the surrounding area has been extensively harvested in the past. The road would be closed after logging is completed, so road effects should be temporary. The three unique units in VCU 531.1 are in WAA 1527. None have special subsistence concerns other than being in a high-use subsistence area. Units for this alternative in VCUs 528, 529, and 530 have no special subsistence significance.

Further east in WAA 1529, the harvest of units in VCU 532 (WAA 1529) east of Red Bay are in the high-use subsistence area of several communities (TRUCS maps; Table 3-135) in a previously unroaded and unlogged area. Combined with the harvest from units included in all action alternatives, the East Red Bay Road units could have a significant effect upon subsistence. Direct loss of habitat would reduce the deer capability. Long-term effects would result from increased access. While timber harvest is taking place, road access could be expected to at least temporarily increase hunting effort in the area. Since the roads would be closed once logging is finished, this can be expected to be a temporary effect. The effects of harvesting Units 534.1-204 and -211 (upper North Salmon Bay Lake Road, WAA 1528) are described above under Alternative 4.

Southeast Subsistence Use Area Units. There are three units in Alternative 5, other than the commonly shared units. All are shared with Alternative 4 (539-220, -221, -222) and one with Alternative 6 (539-222). All three units are near Exchange Cove and have some special subsistence concerns. Local informants state that this is an important hunting area, of which they are more protective than other parts of their "high-use" subsistence area.

Alternative 6

Northwest Subsistence Use Area Units and Road Effects. In addition to the commonly shared units, Alternative 6 contains 4 units in this area. None are unique to this alternative. Two are shared with Alternative 5 (528-250, -251), two with Alternative 4 (529-256, -284), and all four with Alternative 3. None have special significance for subsistence, other than being in a high-use subsistence area.

Southeast Subsistence Use Area Units. There are three units in Alternative 6, other than the commonly shared units. Two are shared with Alternative 3 (539-210, 540-225), one with Alternative 5 (539-222), and all with Alternative 4. Only one, 539-222, has special significance for subsistence, other than being in a high-use subsistence area. This unit is near Exchange Cove. Local informants state that this is an important hunting area, of which they are more protective than other parts of their "high-use" subsistence area.

Alternative 2

Subsistence Use Area Units. Because Alternative 2 is the full unit pool, most of its effects were discussed above. In addition, it contains three units which appear in no other action alternative. One of these, Unit 531.1-213 in WAA 1527 is in a high-use subsistence area. There are no other special subsistence concerns. The only other effect addressed in relation to Alternative 2 is the Calder Tie Road, although this road segment is an option that may be incorporated in other alternatives, with the exception of Alternative 6.

Calder Tie Road. The Tie Road would facilitate the logistics of any timber offering, providing a logistics option (compared to re-establishment of a camp at Labouchere Bay or at Calder Bay; or commuting from Naukati). Thus this road is an option that may be incorporated in other alternatives.

The effects of the construction of this road upon subsistence could be significant. These effects result mainly from the creation of a large "loop" in the western part of the Project Area, which would increase road access to the southern and southwest portions of the Project Area beyond El Capitan. The effects would be most significant on the communities of Point Baker and Port Protection. These are their "Core" subsistence use areas and increased road access would be expected to increase hunting effort in these areas. Conversely, this would be positive for subsistence hunters from other communities, as well as nonsubsistence hunters. Although WAA 1527 at present has "excess" deer habitat capability, increased access stimulated through a Calder Tie Road would be expected to increase harvest close to (or beyond) that supportable by local habitat capability.

Effects on Specific Communities

Project alternatives would have greater effects on community subsistence patterns when a community has a relatively restricted hunting territory and a substantial amount of this territory is included in the Project Area. As indicated on Table 3-135, the fewer the number of WAA's included in a community "Core" and "Main" hunting area, the more restricted that area is. Inclusion of one of a community's "Core" hunting area WAA's has potentially greater effects than would inclusion of a "Main" hunting area WAA. The greater the number of WAA's included in a community's "Core" and "Main" hunting use areas, generally the more community hunters rely on roads (or commercial fishing activities) to provide access to hunting opportunities, and the more flexibility is available to hunters in terms of alternate areas that they can hunt.

Thus, the three communities likely to be most affected are Port Protection, Point Baker, and Whale Pass. All have "Core" hunting territories of only one WAA, which is included in the Project Area. Port Protection's "Main" hunting area is the same as its "Core" area. Point Baker has three WAA's in its "Main" hunting area, two of which are included in the Project Area. Whale Pass has eight WAA's in its "Main" use area, four of which are included in the Project Area.

Other communities with "Core" hunting area WAA's in the Project Area also may be affected by the proposed action, but not to the same degree since they have larger "Core" and "Main" use areas (Craig, Klaawock, and Wrangell, as well as the nonrural Ketchikan). Communities with only "Main" use WAA's in the Project Area are less likely to be affected (Coffman Cove, Hollis,

Metlakatla, and Petersburg). Other qualitative information indicates that Coffman Cove and Klawock may be affected.

Each community has a different combination of WAA's in its "Core" and "Main" use areas. Cumulative effects have been assessed for each community through use of TLMP Draft Revision (1991a) HCM projections for the present (1990) and the years 2004 and 2040. For each community, the change in the habitat capability in "Main" and "Core" deer use areas has been examined by projecting the demand for deer from those WAA's in 2004 and 2040 and the years 2004 and 2040 for each of these groupings of WAA's. These values are presented in terms of their relation to 1954 deer habitat capability values for the same WAA groupings (percentage). HCM results derived from TLMP are unadjusted for habitat fragmentation effects, which are available only for Project Area WAA's. For each community, projections of community as well as of total deer demand are also presented graphically. These data are discussed in relation to other available information in the summaries below, and in more detail in the subsistence resource report.

Coffman Cove

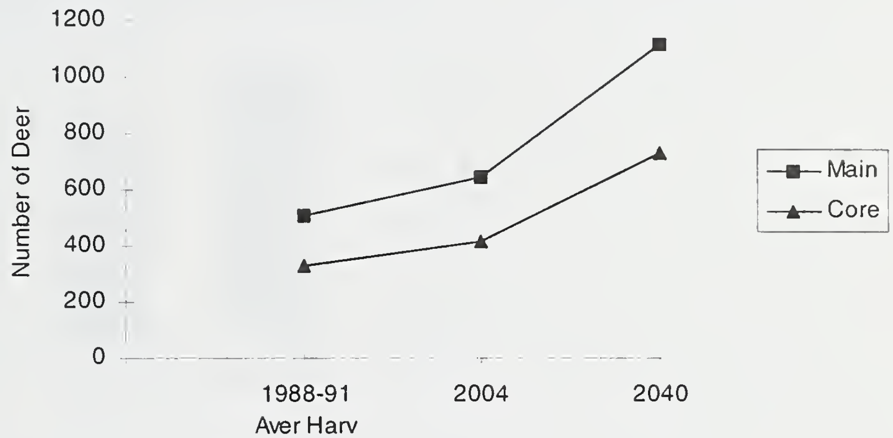
Coffman Cove hunters reported harvesting 19 percent of their deer from Project Area WAA's from 1988-1991. This equates to about 5 percent of the total deer taken from the Project Area. WAA 1530 is a significant part of the Coffman Cove use area. The discussion of general subsistence deer harvest in WAA 1530 above has indicated that further reduction in deer habitat capability and/or increased demand for deer from this area may require the restriction of nonsubsistence take.

The only parts of the Project Area reported to be used by more than 5 percent of Coffman Cove hunters are the road corridor to Whale Pass and most of Thorne Island. All action alternatives include Thorne Island and so are likely to significantly restrict Coffman Cove subsistence activities. Action alternatives vary in the number of "mainland" subsistence units, but none are in Coffman Cove's "high-use" subsistence area. Thus the direct effect of the action alternatives on Coffman Cove subsistence users would be limited, except for alternatives which include conventional timber harvest on Thorne Island. The uneven-aged management plan would greatly reduce these effects.

Cumulative effects can be evaluated based on the habitat capability projections in the TLMP Draft Revision (1991a) for Coffman Cove's subsistence use area (Figure 3-32B) and the projected demand for deer from these areas (Figure 3-32A). The habitat capability of Coffman Cove's "Core" use area (WAA's 1420 and 1421) would decline substantially under the TLMP Draft Revision (1991a) preferred alternative. At the same time demand for deer is projected to increase significantly. The same pattern holds for Coffman Coves' "Main" use area ("Core" WAA's plus WAA 1530).

Thus, even though Coffman Cove takes only 19 percent of its deer from the Project Area, it potentially would be affected by any of the proposed action alternatives. Coffman Cove hunters may need to increase their effort in less productive WAA's, or to reduce their take. Either could be a significant effect.

Figure 3-32A
Coffman Cove: Deer Harvest and Projected Demand



Source: TLMP Draft Revision (1991a) and Project Planning Record

Figure 3-32B
Coffman Cove: Relative Habitat Capability for Deer

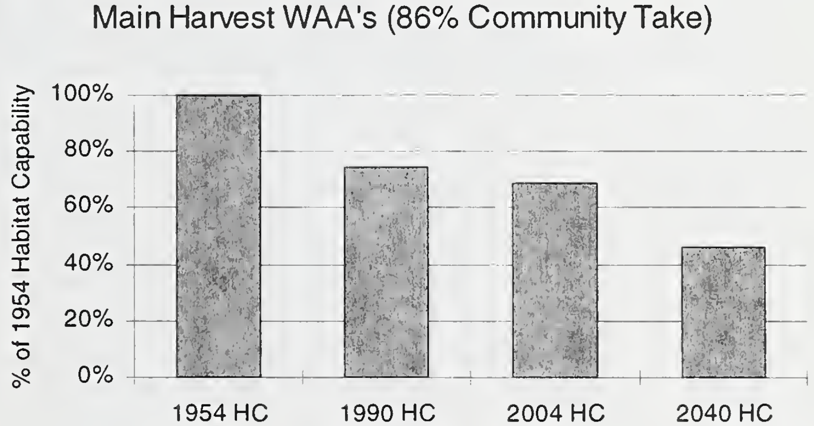
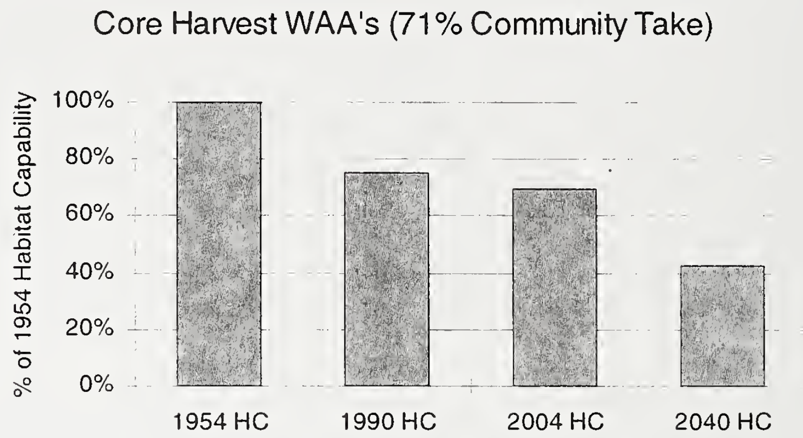


Figure 3-32B (continued)
Coffman Cove: Relative Habitat Capability for Deer



Source: TLMP Draft Revision (1991a) and Project Planning Record

Craig

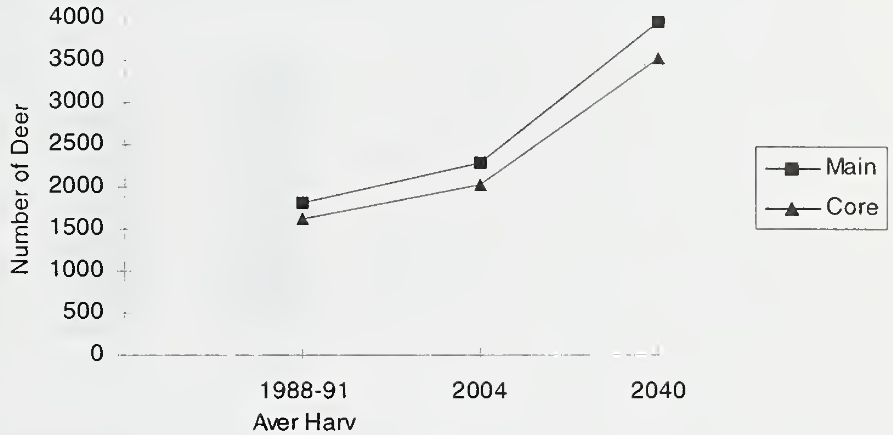
Only nine percent of Craig deer were harvested from Project Area WAA's during 1988-1991, taken in large part from WAA 1529. Craig's use area displays a different subsistence pattern than Coffman Cove, possibly because Craig's "Main" use area is made up of several WAA's.

Subsistence hunters take 72 percent of all the deer harvested in Craig's "Core" use area as well as 72 percent of those harvested from the "Main" use area. Further reduction in habitat capability might require the restriction of nonsubsistence take. Under the TLMP preferred alternative, habitat capability in the "Core" use area would decline substantially, (Figure 3-33B) and demand is expected to increase significantly (Figure 3-33A).

Craig's future deer harvest May be affected by implementing any of the action alternatives because the habitat capability of both the "Core" and "Main" use areas would drop (Figure 3-33B). However, Craig hunters use a number of WAA's, the most important of which are located closer to the community. The Lab Bay Project Area is most important for outlying hunting opportunities, used when more commonly harvested areas are unproductive.

The road construction associated with each of the action alternatives also could affect Craig hunters, increasing their ease of access to more deer, while also increasing competition for them. All action alternatives include units that would foster this effect.

Figure 3-33A
Craig: Deer Harvest and Projected Demand



Source: TLMP Draft Revision (1991a) and Project Planning Record

Figure 3-33B
Craig: Relative Habitat Capability for Deer

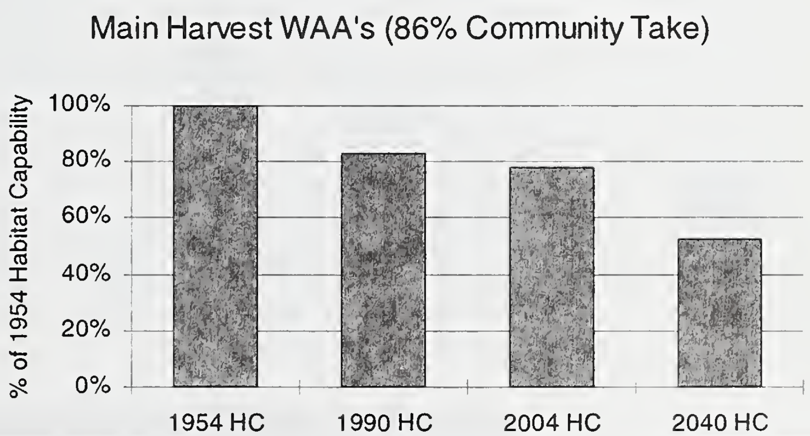
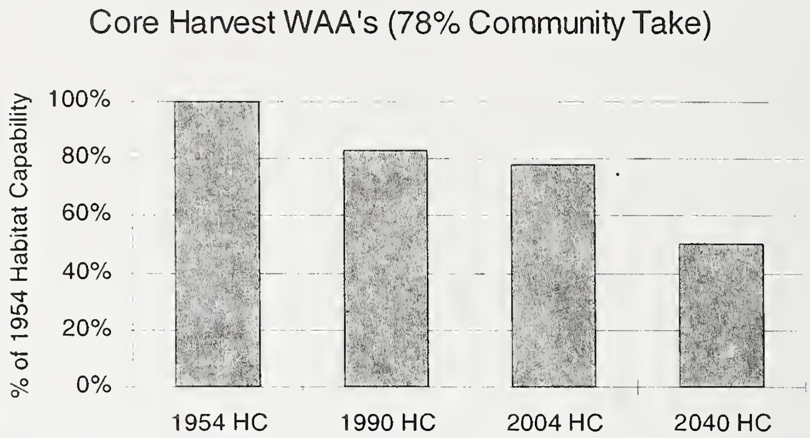


Figure 3-33B (continued)
Craig: Relative Habitat Capability for Deer



Source: TLMP Draft Revision (1991a) and Project Planning Record

Craik Logging

Craik Floating Logging Camp moved into the Calder area early in 1992 and left in 1994. Based on harvest records from their previous location and interviews with community residents, the annual community harvest of deer was estimated to be 25 to 30 animals. This would represent a substantial increase in the average harvest from WAA 1527, which was about 35 deer for the 1988-1991 period. The 1991 harvest was the highest, at 57, so it is projected that the new demand with Craik Logging would be in the range of 65 to 85 deer a year. The direct habitat capability effects of the proposed action would be unlikely to have any significant effects upon the subsistence activities of Craik Logging or a similar logging camp.

The increased demand for deer in WAA 1527 because of a logging camp would exist only as long as logging operations are active in the area. A more serious potential effect would be the logging roads and improved access to WAA 1527, west and north of El Capitan. If roads are built and maintained, hunters from other communities would probably increase their use of this area. Given the relatively limited habitat capability of WAA 1527, it is very likely that nonsubsistence hunting would have to be restricted. The easiest way to mitigate this effect would be to restrict or control the use of any roads built in this area for logging operations, and not to permit any permanent settlement.

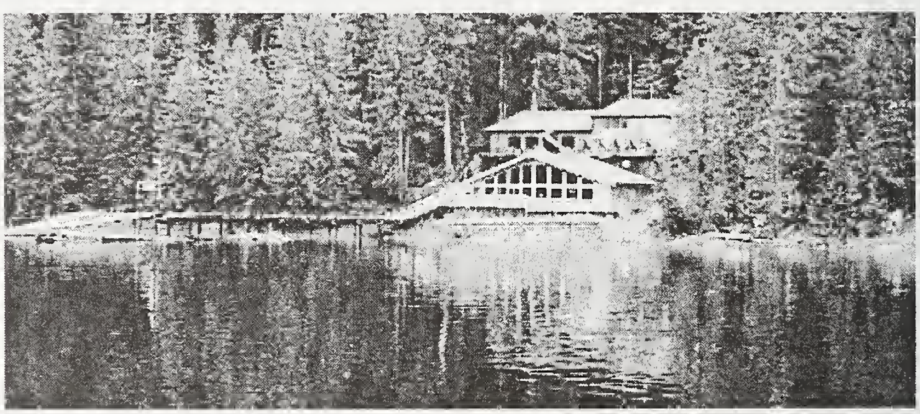
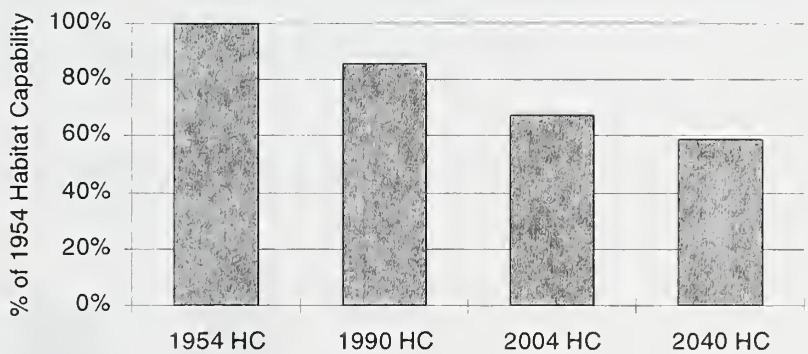


Figure 3-34A
Craik: Deer Harvest and Projected Demand

Source: TLMP Draft Revision (1991a) and Project Planning Record

Figure 3-34B
Craik: Relative Habitat Capability for Deer



Source: TLMP Draft Revision (1991a) and Project Planning Record

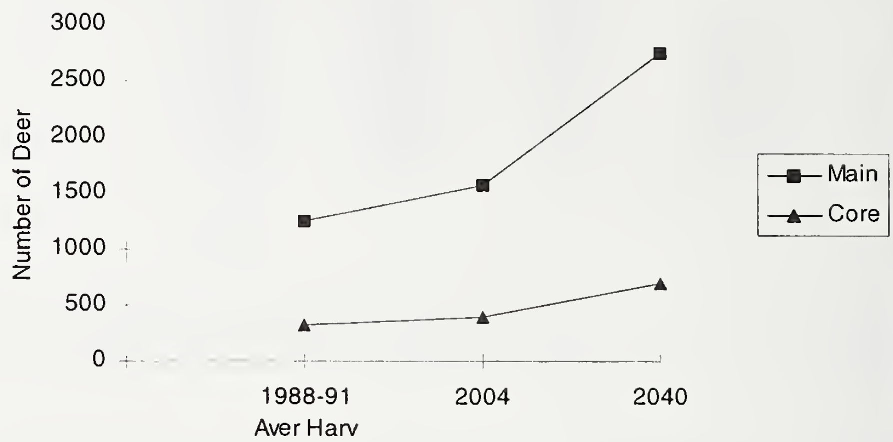
Hollis

Hollis hunters reported harvesting 12 percent of their deer from Project Area WAA's during 1988-1991, evenly split between WAA 1529 and WAA 1530 and accounting for less than 1 percent of the total Project Area take. Any further reduction in habitat capability probably would require the restriction on nonsubsistence take.

While two Project Area WAA's are included in the community's main hunting area, they are not part of the grouping of "Core" WAA's from which Hollis hunters have been reported harvesting deer. These "Core" WAA's are near the community and are not readily road accessible. The

proposed actions in the Project Area thus may not directly affect most Hollis hunters, but would contribute to an overall restriction of their community pattern of subsistence (Figure 3-35B). Taking projected increased demand for deer into account only exacerbates these effects Figure 3-35A).

Figure 3-35A
Hollis: Deer Harvest and Projected Demand



Source: TLMP Draft Revision (1991a) and Project Planning Record

Figure 3-35B
Hollis: Relative Habitat Capability for Deer

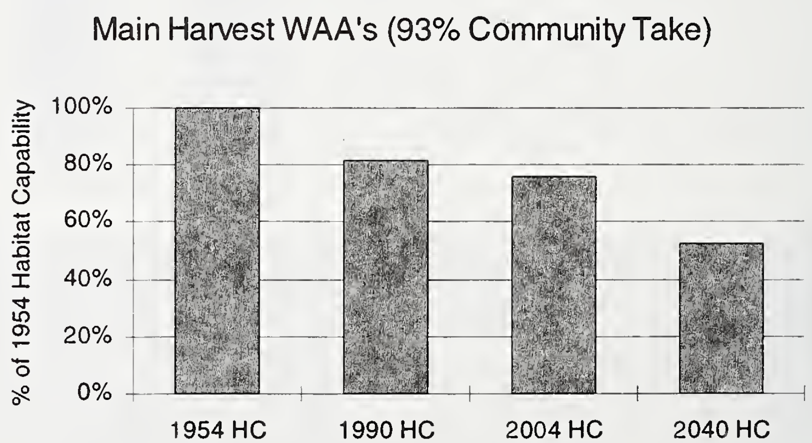
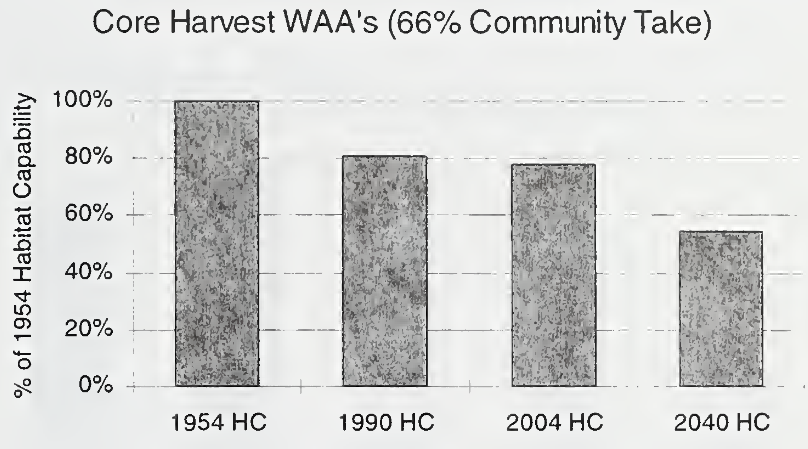


Figure 3-35B (continued)
Hollis: Relative Habitat Capability for Deer

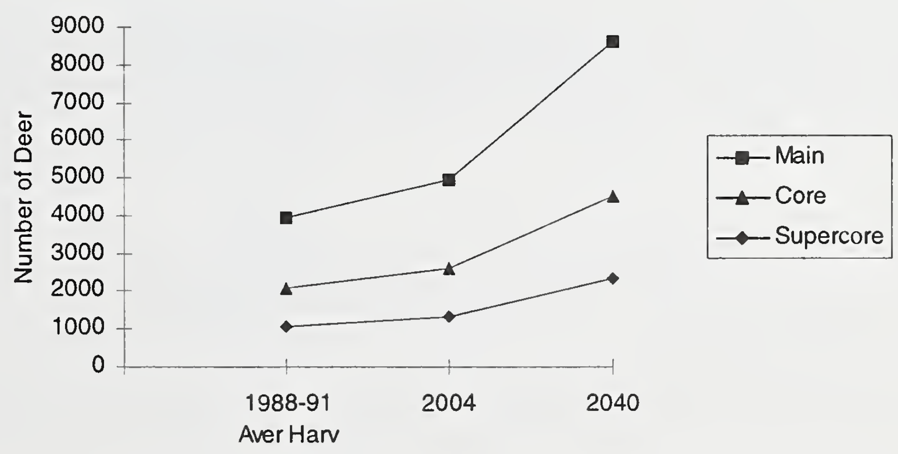


Source: TLMP Draft Revision (1991a) and Project Planning Record

Ketchikan

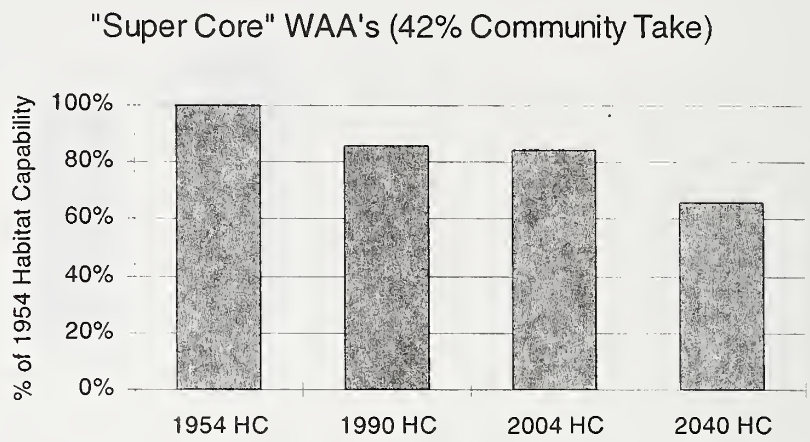
Ketchikan is not a subsistence community, but must be discussed in terms of cumulative effects as its hunters have a significant effect upon all other Project Area users. Ketchikan hunters reported harvesting 9 percent of their deer from Project Area WAA's during 1988-1991, with most coming from WAA 1530 and WAA 1529. Of the total deer taken from the Project Area, Ketchikan hunters take about 30 percent — 27 percent of WAA 1529's total harvest, 39 percent of WAA 1530's, 27 percent of WAA 1527's, and 4 percent of WAA 1528's. The road-connected Project Area WAA's are heavily used by Ketchikan hunters who are overwhelmingly road-oriented.

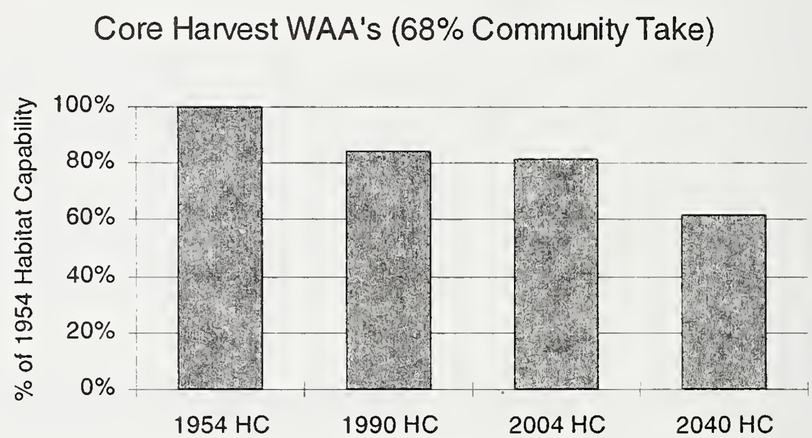
Figure 3-36A
Ketchikan: Deer Harvest and Projected Demand



Source: TLMP Draft Revision (1991a) and Project Planning Record

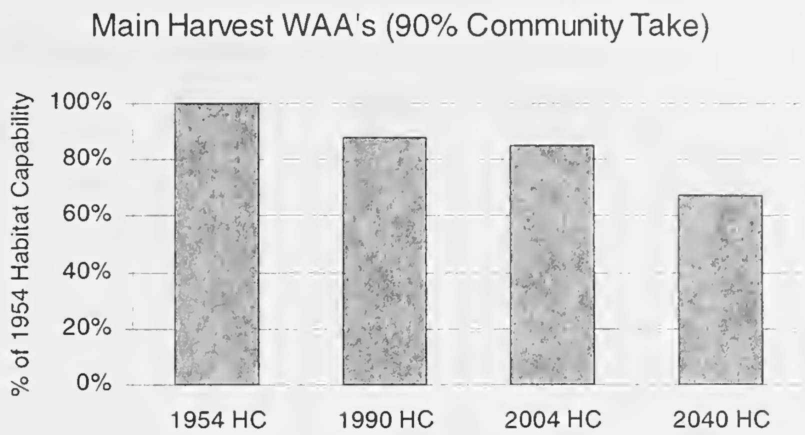
Figure 3-36B
Ketchikan: Relative Habitat Capability for Deer





Source: TLMP Draft Revision (1991a) and Project Planning Record

Figure 3-36B (continued)
Ketchikan: Relative Habitat Capability for Deer



Source: TLMP Draft Revision (1991a) and Project Planning Record

Ketchikan's total deer harvest is so large and the area used so extensive that there is no single hunting pattern for the community. This requires a unique category of WAA grouping, the "Super Core" (Figure 3-36B). WAA 1530 is part of Ketchikan's "Super Core" and "Core," while WAA 1529 is part of the "Core" use grouping. WAA's 1527 and 1528 are part of Ketchikan's "Low" use area. Deer habitat capability is projected to decrease significantly in all of Ketchikan's important deer use WAA groupings (Figure 3-36B). Any further reduction in habitat capability could require the restriction on nonsubsistence take in these WAA's.

The TLMP Draft Revision (1991a) preferred alternative projects that habitat capability in WAA's 1529 and 1530 will be able to support, at best, the historically documented subsistence deer harvest, and thus would require that Ketchikan hunters be restricted from this area. Ketchikan hunters would have to adjust by using hitherto less intensively used portions of their historical use area. There is a reasonable amount of flexibility in the Ketchikan hunting pattern so that this would be possible, and some restrictions would be tolerable to the system as a whole.

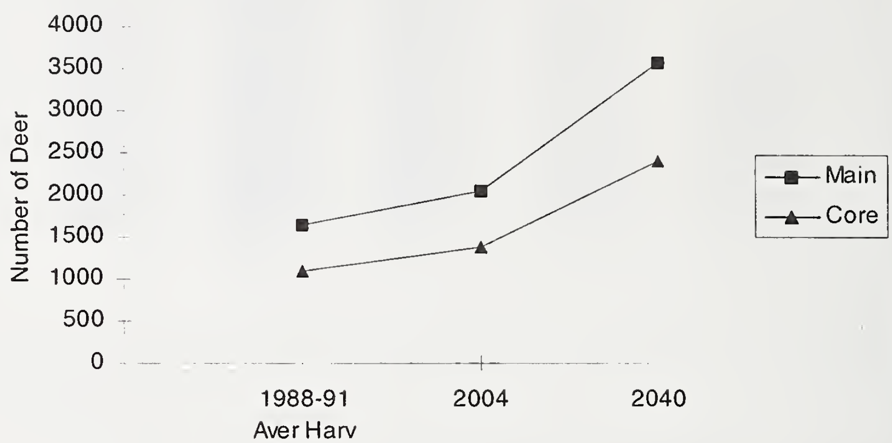
Taking projected increases in demand for deer into account, total demand should be supportable in 2004 in Ketchikan's "Main", "Core", and "Super Core" use areas. By approximately 2040, however, demand would be about twice the available supply, and it is likely that Ketchikan hunters would have only limited access to federal land for deer since restrictions may be in place on Prince of Wales Island.

Klawock

Klawock hunters reported harvesting 11 percent of their deer from Project Area WAA's during 1988-1991. Of the total deer taken from the Project Area, Klawock hunters harvest about 7 percent (8 percent of WAA 1529's total harvest, 28 percent of WAA 1527's, and 12 percent of WAA 1528's, with no harvest from WAA 1530). Klawock's "Core" hunting areas indicate the importance of proximity to the community and access by road. WAA 1529 is included in Klawock's "Core" use WAA grouping (as for Craig), although only marginally so. Two Project Area WAA's are part of Klawock's "Main" WAA use grouping (1527 and 1528).

Any further reduction in habitat capability may require the restriction of the nonsubsistence take. This is reflected in the projected habitat capability of Klawock's "Main" and "Core" WAA use groupings (Figure 3-37B) and the projected increase in demand for deer within these same WAA groupings (Figure 3-37A).

Figure 3-37A
Klawock: Deer Harvest and Projected Demand



Source: TLMP Draft Revision (1991a) and Project Planning Record

Figure 3-37B
Klawock: Relative Habitat Capability for Deer

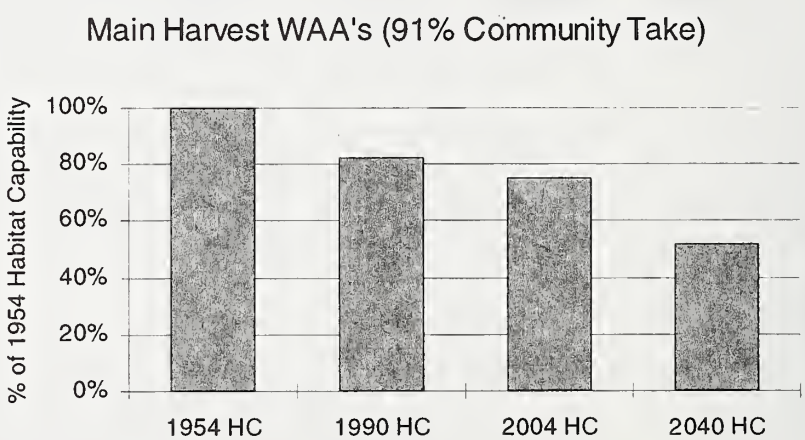
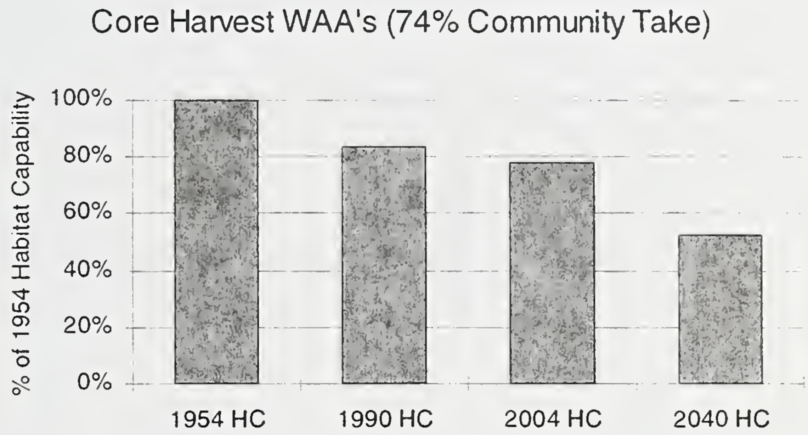


Figure 3-37B (continued)
Klawock: Relative Habitat Capability for Deer



Source: TLMP Draft Revision (1991a) and Project Planning Record

Regions used for hunting deer by more than 5 percent of Klawock households are primarily the road corridors, the west shore of Exchange Cove, and the east shore of Prince of Wales Island above Exchange Cove. A significant pattern is the large percentage (15 to 25 percent) of households which reported using the rough roads in the western portion of WAA 1527. Thus the most significant effect of the proposed actions would be increased access (and potential competition) due to road construction. Alternatives 2 and 5 include units in the west part of WAA 1527 that would foster this effect. All action alternatives include units to the east and west of Exchange Cove which may significantly affect the number of deer available to Klawock hunters. Given the lack of reported harvest in this area by Klawock hunters and the potential access effects of the proposed actions, these effects are uncertain.

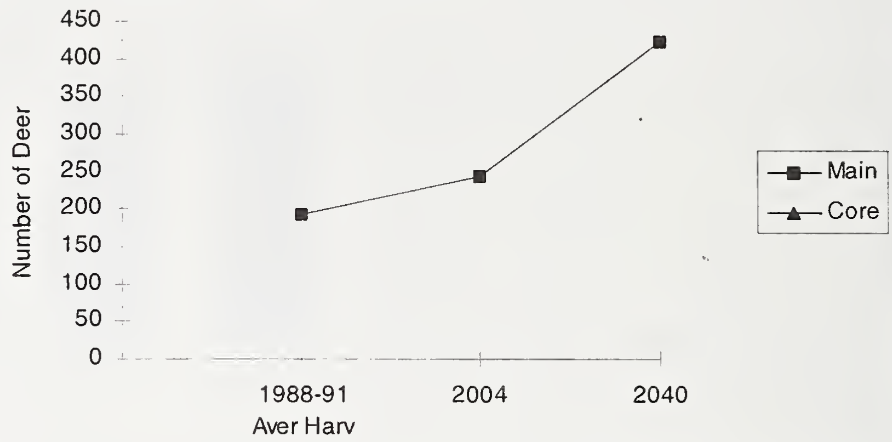
Under the TLMP Draft Revision (1991a) preferred alternative, habitat capability is reduced within the "Main" grouping. Habitat capability could decline substantially in the "Core" use area. Klawock's deer harvest would be affected by logging activities, as the habitat capability of both the "Core" and "Main" harvest WAA's declines and demand for deer increases.

Labouchere Bay

Labouchere Bay hunters reported harvesting 92 percent of their deer from Project Area WAA's during 1988-1991, almost all of it from WAA 1529. They took about 9 percent of the total deer from the Project Area, which breaks down to 20 percent of all the deer taken in WAA 1529 and 1 percent of all the deer taken in WAA 1527. Any further reduction in habitat capability may require the restriction of nonsubsistence take (Figure 3-38B).

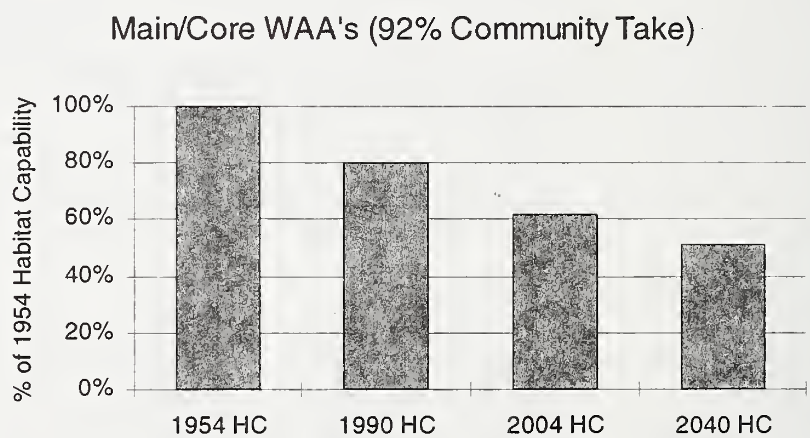
Because the Labouchere Bay logging camp has been deactivated, these projections may be irrelevant. Demand for deer in areas hunted by former Labouchere Bay residents may decline, but this is not certain since many reportedly have relocated to Naukati and may still hunt in WAA 1529.

Figure 3-38A
Labouchere Bay: Deer Harvest and Projected Demand



Source: TLMP Draft Revision (1991a) and Project Planning Record

Figure 3-38B
Labouchere Bay: Relative Habitat Capability for Deer

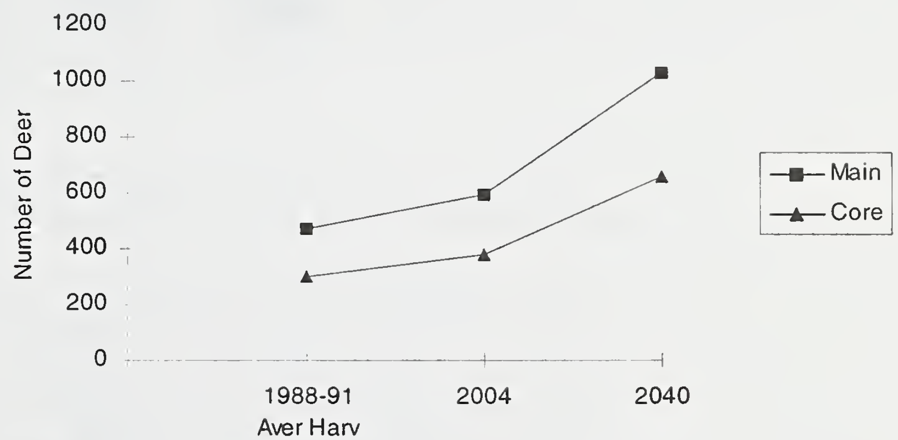


Source: TLMP Draft Revision (1991a) and Project Planning Record

Naukati

Naukati hunters reported harvesting 5 percent of their deer from Project Area WAA's during 1988-1991, all from WAA 1530. This represents less than 1 percent of all deer taken in the Project Area, and less than 1 percent of all deer taken in WAA 1530. No Project Area WAA is included within Naukati's "Core" or "Main" WAA harvest group. Any further reduction in habitat capability may require the restriction of nonsubsistence take in WAA 1530. Given its documented low use by Naukati subsistence hunters, however, the proposed alternatives are unlikely to have significant direct effects upon Naukati's subsistence patterns.

Figure 3-39A
Naukati: Deer Harvest and Projected Demand



Source: TLMP Draft Revision (1991a) and Project Planning Record

Figure 3-39B
Naukati: Relative Habitat Capability for Deer

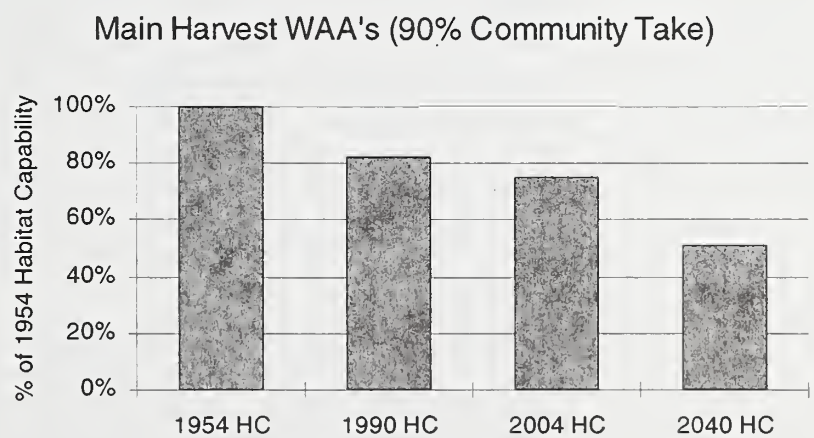
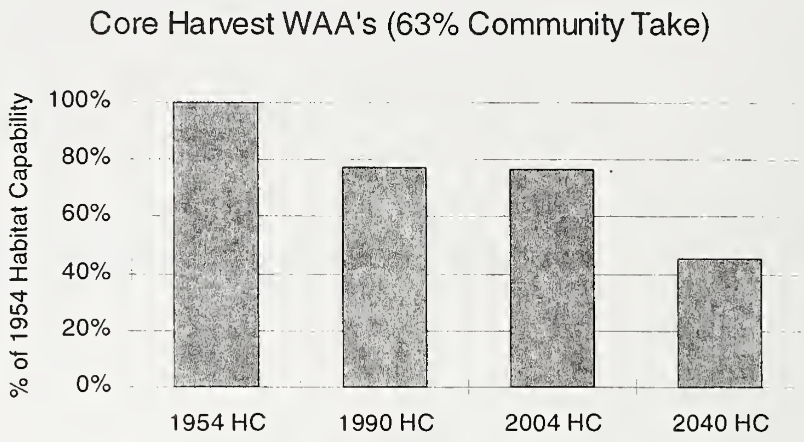


Figure 3-39B (continued)
Naukati: Relative Habitat Capability for Deer



Source: TLMP Draft Revision (1991a) and Project Planning Record

Because of projected cumulative effects of past harvest actions (Figure 3-39B), Naukati hunters may have to increase their level of effort in order to harvest the same amount as before, or it may need to hunt a different area, farther from the community.

The Project Area WAA most likely to be used as an additional harvest area by Naukati residents, judging from past harvest patterns, is 1530, as it is road connected to Naukati and many residents have worked in that area. The proposed action reduces the flexibility of this pattern by reducing the habitat capability of WAA 1530 so that it cannot accommodate "displaced" hunters from other areas. New Naukati residents, who formerly lived in Labouchere Bay, may increase Naukati hunting effort in WAA 1529.

While there is some doubt about the amount of Naukati's harvest of deer, there is no doubt that Naukati hunters harvest deer primarily from their immediate area (either along the roads or using small boats to access islands and other nearby areas). The ADF&G harvest statistics indicate an annual community harvest of about 29 animals, while most local informants estimated 100 animals. This is arrived at by multiplying the approximately 50 local hunters by the average individual take (about 2 deer). This may indicate that the habitat capability of Nakauti's use area currently is being harvested at a higher rate than can be sustained in the long term, or the deer population may be higher than the computed habitat capability.

The projected demand for deer in Naukati's "Main" and "Core" use areas (Figure 3-39A) reinforces these conclusions, as the pattern of effects are similar to other communities. Because Naukati residents presently do not use the Lab Bay Project Area very much, these are cumulative results of overall timber harvest, and are not related to this specific action. It thus appears that the actions proposed in the Project Area would not significantly effect Naukati subsistence patterns, but that the cumulative effects of TLMP certainly could.

Petersburg

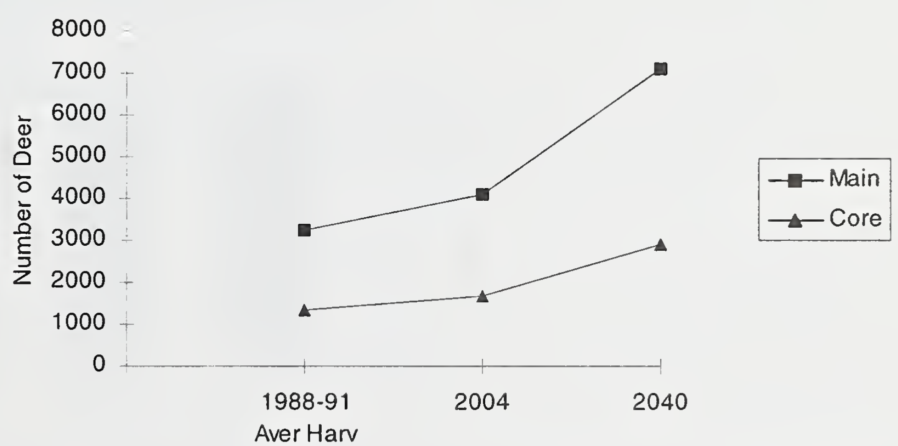
Petersburg subsistence hunters use many different WAA's and employ a variety of methods and strategies. They reported harvesting about 4 percent of their deer from Project Area WAA's during 1988-1991, with some effort in each of the Project Area WAA's (especially 1528 and 1529). Of the total deer taken from the Project Area, Petersburg hunters take about 9 percent — 32 percent of WAA 1528's total harvest, 12 percent of WAA 1527's, 9 percent of WAA 1529's, and 3 percent of WAA 1530's. This has been interpreted as indicating a pattern of boat rather

than road access, since the WAA's with poor road access but good water access are most used. No Project Area WAA's are included in Petersburg's "Core" WAA use group. WAA's 1528 and 1529 are included in the "Main" WAA use group, and WAA's 1527 and 1530 in the "Low" use group. Thus the Project Area is mostly a marginal subsistence use area for Petersburg, important as an alternate hunting area when more central areas are unproductive or when it is used on an opportunistic basis.

TRUCS information supports this, as the only portion of the Project Area used by more than 5 percent of community households is around Exchange Cove and the south shore of Red Bay. Thus, none of the proposed alternatives are likely to have significant direct effects on the subsistence activities of Petersburg. Given the expansive harvest area used by Petersburg and the relatively low level of Project Area use, it is not likely that the proposed actions would have significant effects upon Petersburg subsistence patterns.

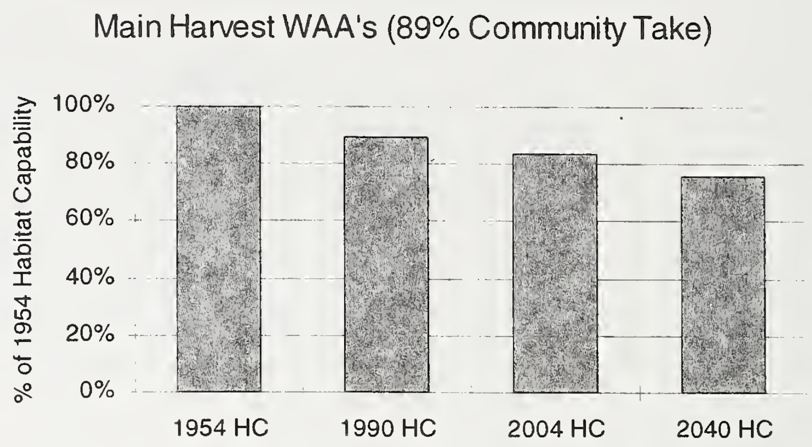
The projected demand for deer in Petersburg's "Main" and "Core" use areas (Figure 3-40A), general pattern of declining long-term deer habitat capability, and the pattern of effects is similar to that for other communities. Because Petersburg residents at present do not use the Lab Bay Project Area very much, these are cumulative results of overall timber harvest, and are not related to this specific action.

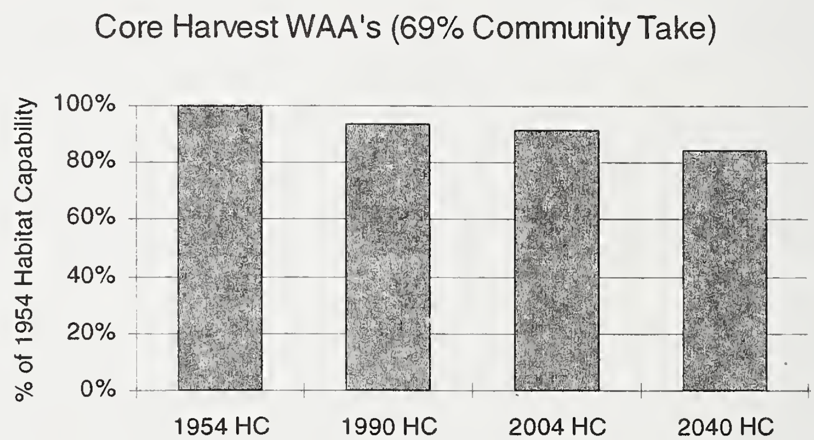
Figure 3-40A
Petersburg: Deer Harvest and Projected Demand



Source: TLMP Draft Revision (1991a) and Project Planning Record

Figure 3-40B
Petersburg: Relative Habitat Capability for Deer





Source: TLMP Draft Revision (1991a) and Project Planning Record

Point Baker

Point Baker hunters reported harvesting 82 percent of their deer from Project Area WAA's during 1988-1991. Sixty-four percent were taken from WAA 1529, 11 percent from WAA 1528, and 7 percent from WAA 1527. Of the total deer taken from the Project Area, Point Baker hunters harvest about 3.5 percent. Point Baker's "Core" hunting area is WAA 1529. Any further reduction in habitat capability may require the restriction on nonsubsistence take in these WAA's. Given that nonsubsistence hunting is minimal in WAA 1528, there are few mitigating measures other than habitat preservation to offset this projected decline.

Over 25 percent of Point Baker's households hunt deer along the north beach fringe of the Project Area (WAA's 1529 and 1528). The east coast and interior also is heavily used (15 to 25 percent of households). All of the proposed action alternatives potentially would restrict Point

Baker subsistence activities. Alternative 6 by far has the least such effect, as it contains only six total units within the high-use subsistence area, and so would have relatively few direct effects. All other action alternatives would have substantially more serious direct effects. All action alternatives would have indirect effects due to road construction and increased competition from hunters from other communities.

The effect of each alternative on Point Baker will be discussed in terms of effects upon deer abundance and access/competition. Point Baker has no reported "high-use" in the southeast portion of the Project Area, so references are to the northwest portion. There are 2 units in this area that are included in all action alternatives. These units have been discussed above, in conjunction with the lower North Salmon Bay Lake Road and Red Lake/Salmon Bay Lake fragmentation effects. They would affect Point Baker subsistence use, but road closures would mitigate these effects to some degree.

Alternative 3 would affect Point Baker subsistence use — more than Alternative 6 and the "No Action" Alternative, but less than Alternatives 2, 4, and 5. It contains 13 units within Point Baker's high-use subsistence area in addition to those contained in all action alternatives. Timber harvest from these 13 units would generally reduce habitat capability. Unit 529-270 is especially sensitive, as it is considered vital by local residents as a wildlife corridor, is heavily used for subsistence activities, and is very close to the community. Road effects upon the community, while perhaps of a temporary nature, would be significant (upper Salmon Bay Lake Road, east Red Bay Road).

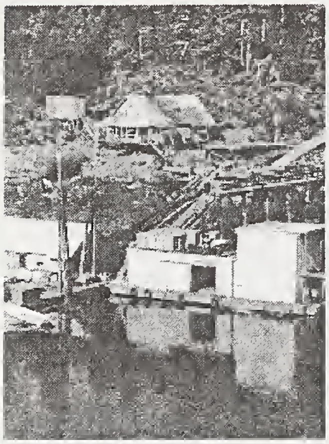
Alternative 4 would have more effect on Point Baker subsistence patterns. It includes 19 timber harvest units within the community's high-use subsistence area, in addition to those contained in all action alternatives. Timber harvest from these 19 units would generally reduce habitat capability. Units 529-286 and 530-241 are more sensitive as they are very near the coast and heavily used for subsistence. This alternative also contains four units in VCU 527. This is a very high-use area surrounding the community, and these units received much public comment. Their harvest would affect not only use patterns, but also less tangible (aesthetic, ideological) aspects of subsistence. Road effects upon the community, while perhaps of a temporary nature, would be significant (upper Salmon Bay Lake Road, east Red Bay Road).

Alternative 5 would have even more effect upon Point Baker subsistence use patterns. It includes 18 harvest units within the community's high-use subsistence area, in addition to those contained in all action alternatives. Timber harvest from these 19 units would generally reduce habitat capability. Among these are several which are of special concern. Besides the four units in VCU 527 contained in Alternative 4, there are two others which are even more significant. Units 527-206 and -226 are directly behind the communities, are heavily used for a variety of activities, and received much public comment. Road effects upon the community, while perhaps of a temporary nature, would be more significant for this alternative than for the others (upper Salmon Bay Lake Road, east Red Bay Road, west Red Bay Road).

Alternative 6 would have the least effect upon Point Baker subsistence use, other than the "No Action" alternative. It contains only 4 units in the community's high-use area, other than those commonly shared by all action alternatives. While timber harvest in this area does reduce habitat capability none of these units has special significance other than being in a high-use area. This alternative would impose no additional road effects upon Point Baker, other than the lower North Salmon Bay Lake Road units contained in all action alternatives.

Alternative 2 would have the greatest potential effect on Point Baker, combining those of all the other action alternatives, plus an additional subsistence unit, plus the effects of the Calder Tie Road. The Calder Tie Road by itself would have significant potential effects upon the subsistence use pattern of Point Baker resource users.

All of the action alternatives could significantly restrict Point Baker subsistence activities, both from direct abundance/distribution as well as access/competition effects. Alternative 6 has by far the least potentially adverse effect.

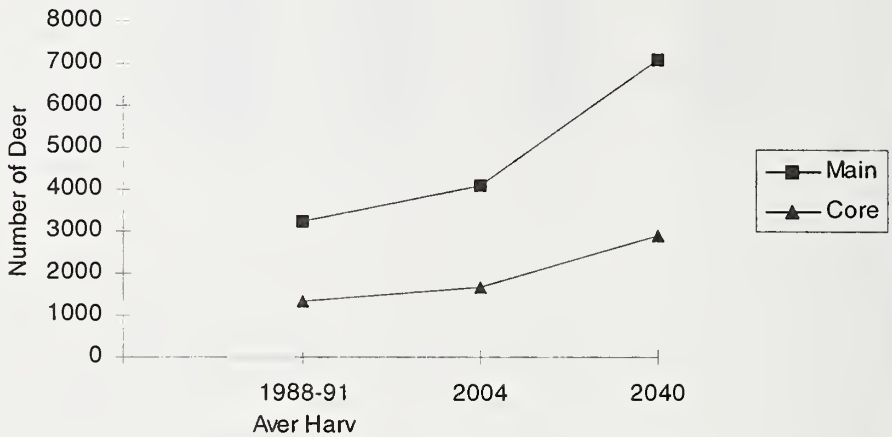


Point Baker

In terms of cumulative effects, all of Point Baker's subsistence use WAA groupings are projected to decline in terms of deer habitat capability (Figure 3-41B). Displacement of Point Baker from its "Core" hunting area would increase the effort, time, and cost of their harvesting deer. Proximity is a key factor to Point Baker subsistence hunters and displacement often means that hunting ceases. Since this would be the primary effect of the Calder Tie Road, access management is important. The projected demand for deer in Point Baker's "Main" and "Core" use areas reinforces these conclusions (Figure 3-41A).

Figure 3-41A

Point Baker: Deer Harvest and Projected Demand



Source: TLMP Draft Revision (1991a) and Project Planning Record

Figure 3-41B

Point Baker: Relative Habitat Capability for Deer

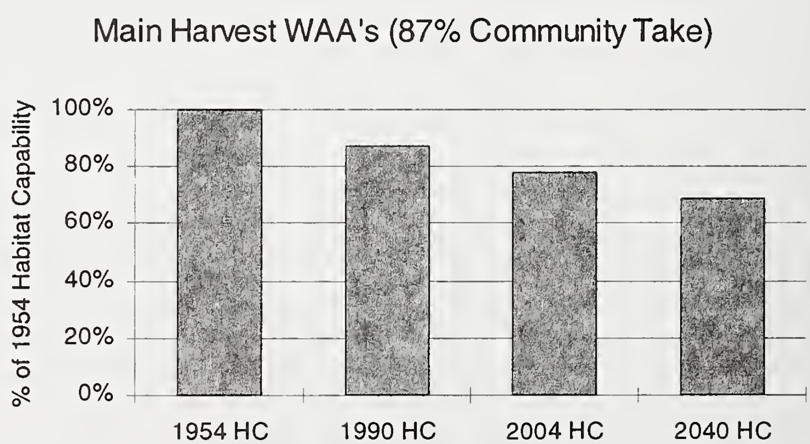
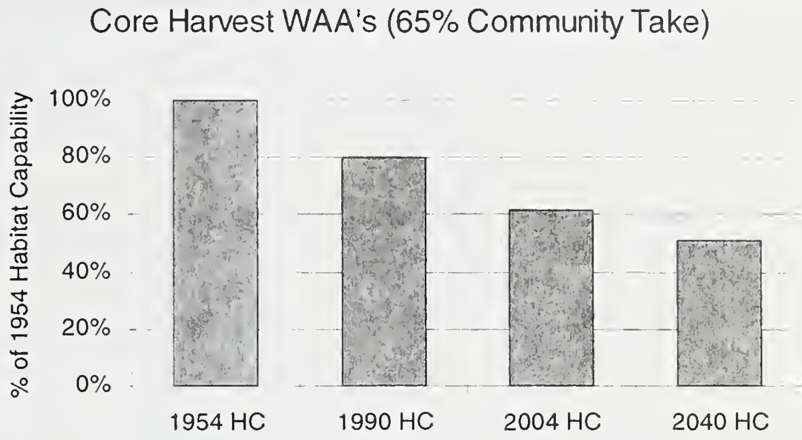


Figure 3-41B (continued)
Point Baker: Relative Habitat Capability for Deer



Source: TLMP Draft Revision (1991a) and Project Planning Record

Port Protection

Port Protection shares with Point Baker many values on the importance of subsistence activities to the life style of the community as well as the view that this subsistence pattern is incompatible with logging activities as currently conducted.

Port Protection hunters reported harvesting 100 percent of their deer from the Project Area during 1988-1991, all from WAA 1529. This represents one percent of the Project Area's total harvest and 2 percent of WAA 1529's total harvest. Port Protection thus presents the same sort of situation as Point Baker, but to a more extreme degree. Port Protection's "Core" hunting area is WAA 1529, with no other documented harvest areas, although TRUCS indicates that hunters use a wider area.

The TRUCS pattern of land use for Port Protection is very similar to that for Point Baker, so that the same analysis by alternative described above for Point Baker applies. Each action alternative has the potential to significantly restrict Port Protection subsistence activities, both from direct abundance/distribution effects as well as access/competition effects (Figure 3-42B). Alternative 6 would have the least adverse effect.

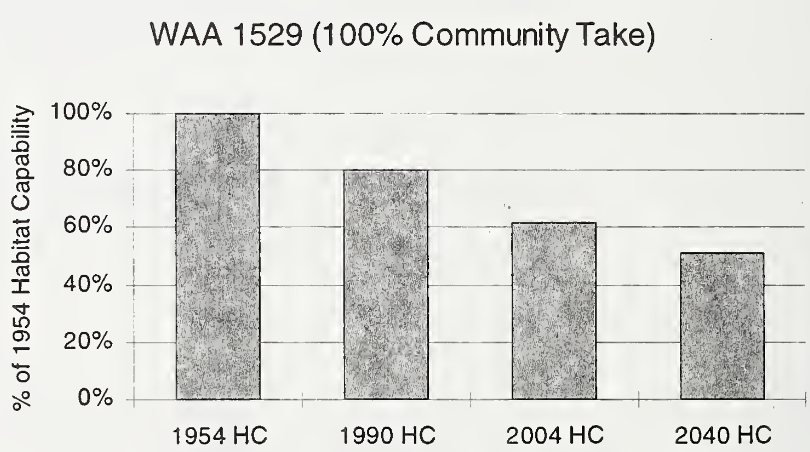
Any further reduction in habitat capability, such as that projected under the preferred alternative of TLMP, may require the restriction on nonsubsistence take. Given the likelihood of past underestimation of the deer harvest, it is possible that Port Protection's subsistence pattern would be significantly affected by the proposed actions due to the direct reduction in habitat capability of their "Main" use area.

The effects of the projected demand for deer upon Port Protection are similar to, but more intense, than those upon Point Baker (Figure 3-42A). Port Protection's documented use area is much smaller than that of Point Baker, so that competitive effects would be greater and the costs to community residents of increasing their hunting range would also be greater.

Figure 3-42A
Port Protection: Deer Harvest and Projected Demand

Source: TLMP Draft Revision (1991a) and Project Planning Record

Figure 3-42B
Port Protection: Relative Habitat Capability for Deer



Source: TLMP Draft Revision (1991a) and Project Planning Record

Whale Pass

Whale Pass reports that 64 percent of its community deer harvest occurs in the Project Area, predominately (49 percent) from WAA 1530, with 4 to 6 percent from each of the other three Project Area WAA's. This represents about 7 percent of the total deer harvest from the Project Area — 13 percent from WAA 1530, 6 percent from WAA 1527, 5 percent from WAA 1528, and 1 percent from WAA 1529. This is nearly the direct opposite of Point Baker's pattern. Whale Pass is a larger and more diverse community where many people are directly or indirectly dependent upon the timber industry, and where most hunters are road-oriented.

The TRUCS map indicates that Whale Pass deer hunters use essentially the entire Project Area, with over 15 percent of community households hunting in the entire eastern half of the Project Area, and over 25 percent using the road corridors and the area above Exchange Cove. All of the proposed action alternatives have the potential to significantly restrict Whale Pass subsistence activities, either in the "southeast high use area," the "northwest high use area," or both. All action alternatives would also have indirect effects due to road construction and increased competition from hunters from other communities.

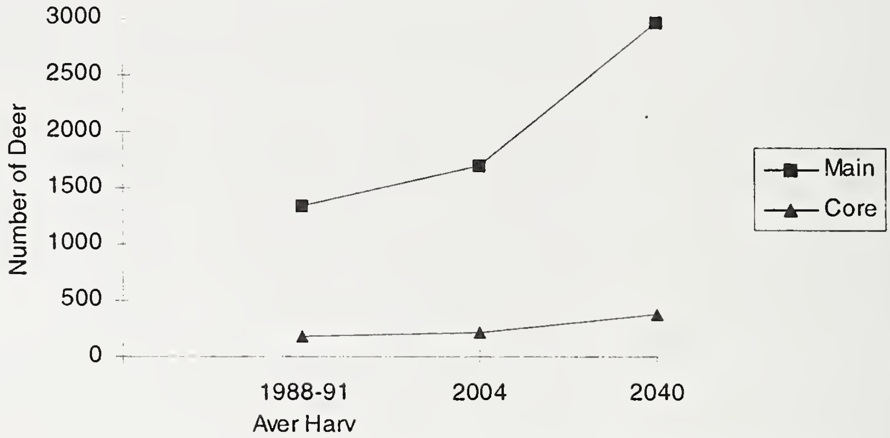
All action alternatives include units within Whale Pass high-use subsistence areas in the northwest and southeast of the Project Area, and all include timber harvest from Thorne Island. Alternative 2 would have the most extreme effects. Alternatives 3 and 5 would have fewer effects on Whale Pass subsistence use than Alternative 2, but would still have effects of about equal magnitude. They both include a conventional harvest plan for Thorne Island, and differ primarily in the balance of effects in the northwest as opposed to the southeast high-use subsistence areas of the Project Area. Alternative 3 may have a marginally smaller overall effect on Whale Pass subsistence use than would Alternative 5. Alternative 4 would have a somewhat smaller overall effect on Whale Pass subsistence use than Alternatives 3 and 5, but this too would be a marginal difference. Although it includes an uneven-aged management plan for timber harvest on Thorne Island, it also includes more units on Prince of Wales Island within the Whale Pass high-use subsistence area. Alternative 6 has by far the least effect upon Whale Pass subsistence use, as it incorporates the uneven-aged management plan for Thorne Island and also has relatively few units within the community's "mainland" high-use subsistence area.

In summary, all action alternatives potentially impose significant restrictions upon Whale Pass residents, primarily through effects on deer abundance and distribution, and because of potential access/competition changes. Potential effects are smallest under Alternative 6.

To assess cumulative effects, projected deer demand and HCM results for the "Core" and "Main" hunting areas for Whale Pass are shown on Figure 3-43B. The importance of proximity to the community and access by road is displayed on Figure 3-25. All four Project Area WAA's are included in the Whale Pass "Main" subsistence use area, as are additional WAA's, south of Whale Pass. All are road-connected, and for the Project Area WAA's, the degree of community harvest is directly related to the extent to which that WAA is roaded. Any further reduction in habitat capability may require the restriction of nonsubsistence take in these WAA's. Given that nonsubsistence hunting is minimal in WAA 1528, there are few mitigating measures other than protecting habitat to offset this projected decline in WAA 1528.

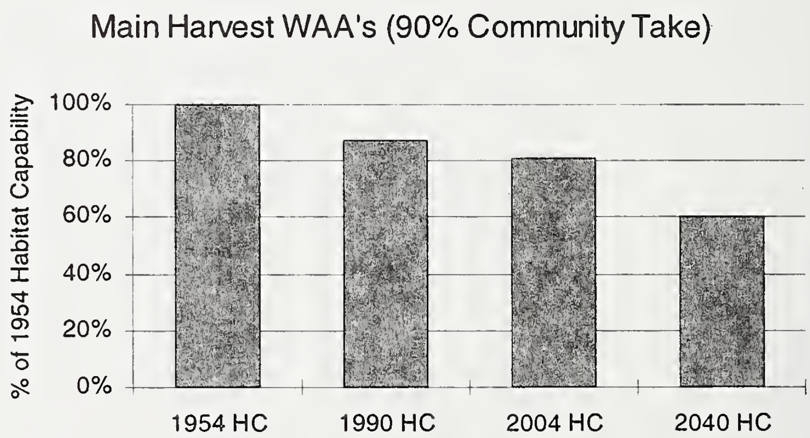
The effects of the projected demand for deer upon Whale Pass are very similar to those upon Point Baker and Port Protection (Figure 3-43A).

Figure 3-43A
Whale Pass: Deer Harvest and Projected Demand



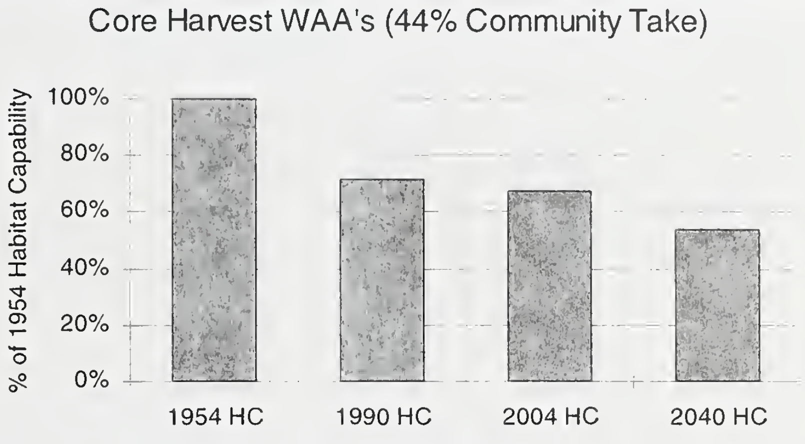
Source: TLMP Draft Revision (1991a) and Project Planning Record

Figure 3-43B
Whale Pass: Relative Habitat Capability for Deer



Source: TLMP Draft Revision (1991a) and Project Planning Record

Figure 3-43B (continued)
Whale Pass: Relative Habitat Capability for Deer



Source: TLMP Draft Revision (1991a) and Project Planning Record

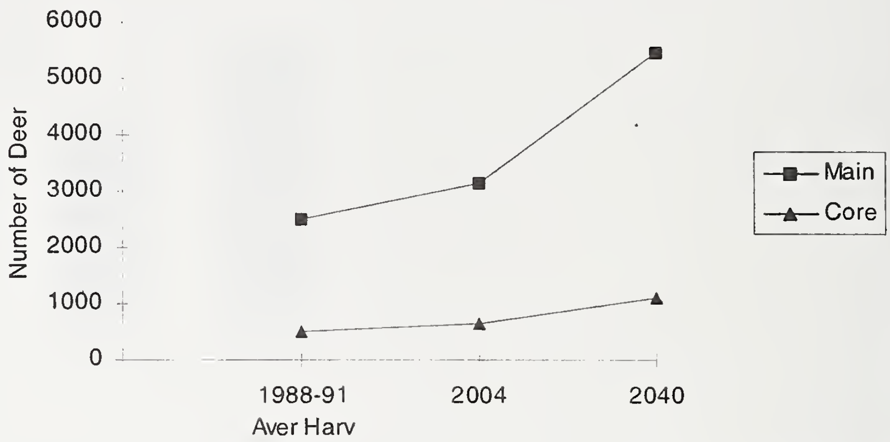
Wrangell

Wrangell reports that 18 percent of its community deer harvest comes from Project Area WAA's, primarily from WAA 1530 (14 percent), with smaller harvests from WAA's 1528 (3 percent) and WAA 1529 (1 percent). This represents 14 percent of the total deer harvested in the Project Area — 27 percent of the total harvest from WAA 1530, 21 percent from WAA 1528, and 2 percent from 1529. This pattern results from Wrangell hunters using boats as their main means of access to deer hunting areas and is an activity that likely occurs in conjunction with fishing. Reduction in habitat capability may require the restriction on nonsubsistence take in these WAA's. Any reduction in habitat capability may require restriction of the nonsubsistence take. Under the TLMP Draft Revision (1991a) preferred alternative, habitat capability would be reduced (Figure 3-44B). Given that nonsubsistence hunting is minimal in WAA 1528, there are few mitigating measures other than habitat protection to offset this projected decline in that WAA.

TRUCS land use information indicates that Wrangell hunters use almost the entire Project Area coast for deer hunting, but at a relatively low level. The only part of the Project Area used by more than 5 percent of Wrangell households is the coast facing Zarembo Island, as far south as the entrance to Whale Pass Cove. Thorne Island is used by less than 5 percent of Wrangell households. Wrangell subsistence hunters would be most affected by activities in and around the Salmon Bay Lake and Exchange Cove areas. Alternatives 2, 4, 5, and 6 include units in the Exchange Cove area. In addition, all action alternatives include some units in the string north of Salmon Bay Lake. Alternative 6 contains the fewest such units, and will have a significantly smaller potential road impact due to this difference. Alternative 6 also has fewer units overall. While it would have the least potential effect on Wrangell subsistence use, all action alternatives may significantly restrict Wrangell subsistence activities.

WAA 1530 is part of Wrangell's "Core" group of WAA's which are composed of areas accessible by boat and reasonably close to Wrangell or good fishing grounds. Most of Wrangell's "Core" WAA's are closer to it than any other community, and access is by boat, making it more difficult for hunters from farther away.

Figure 3-44A
Wrangell: Deer Harvest and Projected Demand



Source: TLMP Draft Revision (1991a) and Project Planning Record

Figure 3-44B
Wrangell: Relative Habitat Capability for Deer

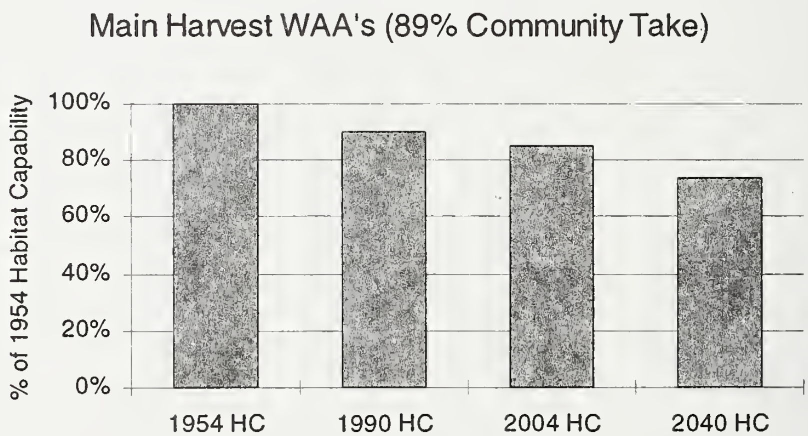
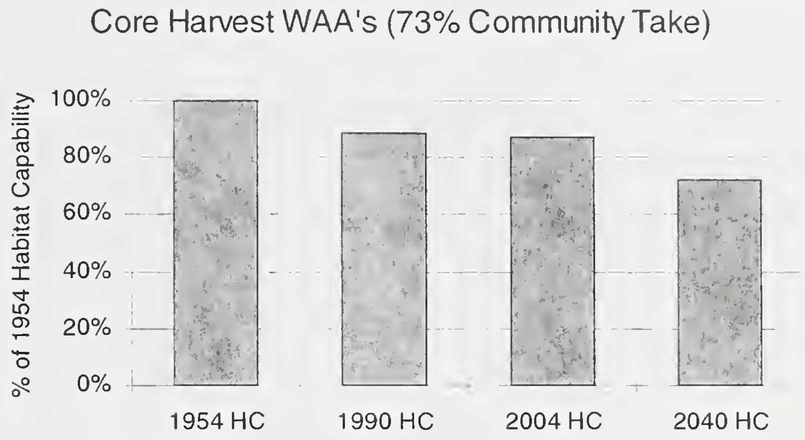


Figure 3-44B (continued)
Wrangell: Relative Habitat Capability for Deer



Source: TLMP Draft Revision (1991a) and Project Planning Record

Wrangell hunters thus may be able to adapt to the sorts of effects that the proposed actions would bring about. Still, the projected effects may impose significant restrictions upon subsistence activities, especially beyond 2040, given the projected increase in the demand for deer (Figure 3-44A).

Summary of Findings for Subsistence Use of Deer

One or more of the proposed actions may significantly restrict the subsistence use of Sitka black-tailed deer by the residents of Coffman Cove, Craig, Klawock, Point Baker, Port Protection, Whale Pass, and Wrangell (Table 3-136). The potential effects of Alternative 6 are far less than of any of the other action alternatives. It has not been possible to summarize this quantitatively in a table, but the reader is referred to the qualitative discussion in the text.

Ketchikan

Table 3-136

Significant Possibility of a Significant Restriction of Subsistence Use of Sitka Black-Tailed Deer

Effect	Alternative 1	2	3	4	5	6
ABUNDANCE OR DISTRIBUTION						
Coffman Cove	Yes[3b]	Yes[4b]	Yes[4b]	Yes[4b]	Yes[4b]	Yes[4b]
Craig	Yes[3b]	Yes[4b]	Yes[4b]	Yes[4b]	Yes[4b]	Yes[4b]
Klawock	Yes[3b]	Yes[4b]	Yes[4b]	Yes[4b]	Yes[4b]	Yes[4b]
Point Baker	Yes[3a]	Yes[4a]	Yes[4a]	Yes[4a]	Yes[4a]	Yes[4a]
Port Protection	Yes[3a]	Yes[4a]	Yes[4a]	Yes[4a]	Yes[4a]	Yes[4a]
Whale Pass	Yes[3a]	Yes[4a]	Yes[4a]	Yes[4a]	Yes[4a]	Yes[4a]
Wrangell	Yes[3b]	Yes[4b]	Yes[4b]	Yes[4b]	Yes[4b]	Yes[4b]
Other Study Communities[1]	Yes[3c]	Yes[4c]	Yes[4c]	Yes[4c]	Yes[4c]	Yes[4c]
Logging Camps[2]	No	No	No	No	No	No
ACCESS/COMPETITION						
Coffman Cove	Yes[3b]	Yes[4b]	Yes[4b]	Yes[4b]	Yes[4b]	Yes[4b]
Craig	Yes[3b]	Yes[4b]	Yes[4b]	Yes[4b]	Yes[4b]	Yes[4b]
Klawock	Yes[3b]	Yes[4b]	Yes[4b]	Yes[4b]	Yes[4b]	Yes[4b]
Point Baker	Yes[3a]	Yes[4a]	Yes[4a]	Yes[4a]	Yes[4a]	Yes[4a]
Port Protection	Yes[3a]	Yes[4a]	Yes[4a]	Yes[4a]	Yes[4a]	Yes[4a]
Whale Pass	Yes[3a]	Yes[4a]	Yes[4a]	Yes[4a]	Yes[4a]	Yes[4a]
Wrangell	Yes[3b]	Yes[4b]	Yes[4b]	Yes[4b]	Yes[4b]	Yes[4b]
Other Study Communities[1]	Yes[3c]	Yes[4c]	Yes[4c]	Yes[4c]	Yes[4c]	Yes[4c]
Logging Camps[2]	No	No	No	No	No	No

Source: Galginaitis 1993

[1] Includes Hollis, Hydaburg, Naukati (permanent settlement), Petersburg, Saxman, and Thorne Bay. These communities are discussed briefly in the text of the EIS or the Subsistence Resource Report, but were excluded from further treatment because of little documented use of the Project Area. Cumulative effects are possible but are difficult to evaluate.

[2] Includes Craik Logging, Naukati (logging camp), Labouchere Bay, and Skowl Arm/Polk Inlet. All are discussed briefly in the text of the EIS or the Subsistence Resource Report. At least part of their populations qualify as Federal subsistence users and harvest various resources. However, since their employment/residence status depends upon timber harvest activity, the effects of timber harvest upon subsistence resources and patterns of use are positive from their perspective.

[3] All study communities have a significant possibility of a significant restriction of subsistence use even in the absence of any further timber harvest in the Project Area. The likelihood and extent of these effects differ by community.

[a] Small communities with relatively small primary subsistence use areas which rely heavily upon the Project Area, so cumulative effects are more likely and more extreme;

[b] Larger and more diverse communities with larger primary subsistence use areas which use portions of the Project Area to a significant degree but usually not as a principal use area -- so cumulative effects are less likely and perhaps not as extreme;

[c] Communities of various sizes which use the Project Area to a limited extent, for which cumulative effects are difficult to evaluate. They would be presumed to be less likely and less extreme, but small communities in this category may still be at considerable risk.

[4] Potential direct effects of the proposed action alternatives upon study communities vary:

[a] Highest possibility of significant restriction on subsistence use due to direct results of action alternatives. The ranking of alternatives from least potential effect to most is Alternative 6, followed by Alternative 3, followed by Alternatives 2, 4, and 5 as a group. Direct effects are a significant possibility in terms of both distribution and abundance and access/competition (see text).

[b] Some possibility of significant restriction on subsistence use due to the direct consequences of the action alternatives. The ranking of alternatives varies by community, but Alternative 6 consistently has the least potential adverse effect. Direct effects upon these communities are more likely to be in terms of access/competition rather than due to effects upon abundance or distribution (see text).

[c] Direct effects of action alternatives confined to access/competition, and the probability of such effects is relatively low. Cumulative and interactive effects almost certainly outweigh direct (project-specific) effects.

Abundance and Distribution of Other Resources

Information on the harvest of mammals other than deer is less detailed, especially for river otter, marten, and wolf. For black bear, data is available distinguishing subsistence from nonsubsistence harvest. No such information is available for the other species, and most of the reported harvest has been assumed to be subsistence. Field interviews indicated that these species, other than bear, are not commonly hunted or trapped, but that a few local residents hunt and trap these species on occasion.

Furbearers — Marten, River Otter, and Wolves

Summary harvest data presented in Table 3-137 and Table 3-138 displays the results of the marten habitat capability model for Alternative 1 (1995) and the project alternative with the greatest potential effect (Alternative 2) upon marten. Harvest has been quite variable and the potential effects of habitat fragmentation and other factors have not been considered. Almost all of the documented harvest is by nonsubsistence users, so restrictions of this user group would be a possible mitigating measure. Few residents of Prince of Wales communities report trapping marten, and they expressed no concern over the health of the populations of these animals.

Table 3-137

Documented Marten Harvest in Project Area

Season	Subsistence	NonSubsistence	Total	WAA 1527	WAA 1528	WAA 1529	WAA 1530
84/85					8	21	
85/86					8	16	
86/87					2	0	
87/88					10	22	
88/89	8	19	27	20	7	-	-
89/90	75	24	99	27	23	49	-
90/91	17	39	56	-	12	5	39
Average	33.33	27.33	60.67	15.67	10	16.14	13

Source: 84/85-87/88 figures from TLMP Draft Revision (1991a). Later figures provided by ADF&G. In 1988, WAA 1527 was divided into WAA's: 1527 and 1530 (with additional parts of old WAA 1527 incorporated into WAA 1526). TLMP Draft Revision (1991a) provides no harvest data for these WAA's.

Table 3-138

Habitat Capability Model Estimates for Marten in Project Area (% of 1954 HC)

Marten	WAA 1527	WAA 1528	WAA 1529	WAA 1530
1954	100	100	100	100
1990	81	90	77	73
1995	56	84	69	43
2004	69	75	65	64
Project Alternative	52	73	63	33
2040	59	69	48	52

Source: TLMP Draft Revision (1991a), Project Planning Record.

River Otter and Wolf

Summary wolf and otter harvest data is presented in Table 3-139, followed by the results of the habitat capability model for Alternative 1 (1995) and the action alternative with the greatest potential effect (Alternative 2), Tables 3-140 and 3-141. Declines in habitat capability for river otter in WAA 1527 may significantly restrict subsistence users. This is an existing condition and not one attributable to the Lab Bay Project, which would have only minimal effect on river otter habitat. Thus, while restrictions may need to be applied to river otter harvest in WAA 1527, it would not be a result of the proposed action.

Local informants did not report any significant trapping or other use of river otter. They failed to mention or did not have a clear idea of the health of the local population. ADF&G harvest data does not indicate the residence of the harvesters, so no subsistence/nonsubsistence comparison can be made.

Table 3-139
Documented Historic Harvest of Wolf and Otter in Lab Bay Area

	Wolf					Otter				
Year	**Total**	**1527**	**1528**	**1529**	**1530**	**Total**	**1527**	**1528**	**1529**	**1530**
1980	1	1	0	0	NA	54	32	8	14	NA
1981	3	2	1	0		37	30	1	6	
1982	5	2	0	3		57	37	2	18	
1983	3	1	0	2		13	9	0	4	
1984	8	4	2	2		8	5	3	0	
1985	8	4	1	3		10	2	3	5	
1986	0	0	0	0		45	38	5	2	
87/88	7	3	1	3	0	27	16	2	3	0
88/89	5	2	1	2	0	4	4	0	0	0
89/90	4	2	1	1	0	26	13	8	5	0
90/91	8	2	0	5	1	2	0	0	0	2
Aver	4.73	2.09	0.64	1.91	0.25	25.73	16.91	2.91	5.18	0.50

Source: Figures for 1980-86 are from TLMP Draft Revision (1991a). Later figures are from ADF&G. In 1988, WAA 1527 was divided into WAA's 1527 and 1530 (with additional parts of the old WAA 1527 incorporated into other WAA's). Thus pre- and post-1988 harvest levels are not comparable.

Informants consistently reported that the local wolf population was healthy, and at least one individual was trapping wolves to increase the local deer population. If logging activities were to reduce deer habitat in the long term, wolves would also decrease. The effect is more certain on deer, and can best be measured and treated there. TLMP Draft Revision (1991a) and project-specific analysis are presented in Table 3-141. There is no known recommendation for a sustainable yield. There also are reasons to believe that the harvest figures may be low. Thus, no definitive conclusions as to subsistence effects can be drawn, except that local residents seem to feel that any such effects would be relatively minor. Although future demand for the harvest of wolf is uncertain, the proposed alternatives are not likely to have any effects upon the subsistence use of furbearer resources.

Table 3-140

Habitat Capability Model Estimates for River Otter, Lab Bay Project Area (% of 1954 HC)

River Otter	WAA 1527	WAA 1528	WAA 1529	WAA 1530
1954	100	100	100	100
1990	85	86	81	83
1995	61	71	72	57
2004	85	86	81	83
Project Alternative	61	71	72	57
2040	85	86	81	83

Source: TLMP Draft Revision (1991a), Project Planning Record.

Table 3-141

Habitat Capability Model Estimates for Wolf, Lab Bay Project Area (% of 1954 HC)

Gray Wolf	WAA 1527	WAA 1528	WAA 1529	WAA 1530
1954	100	100	100	100
1990	86	100	83	70
1995	57	50	58	30
2004	71	100	67	70
Most extreme Project Alternative	57	50	58	20
2040	71	100	50	60

Source: TLMP Draft Revision (1991a), Project Planning Record.

Black Bear

Summary harvest data is presented in Table 3-142, followed by Table 3-143, displaying the results of the black bear habitat capability modeling for Alternative 1 (1995) and the alternative with greatest potential effect. Because all action alternatives are roughly the same in terms of overall HCM effects, and because harvest information for individual communities does not exist, evaluation by each alternative is not justified. TLMP Draft Revision (1991a) does not indicate what proportion of a healthy black bear population can be harvested on a sustained yield basis, but other EIS documents have assumed 10 percent. Since ADF&G requires that all bear hides and skulls be sealed, the harvest numbers have a high confidence level.

The nonsubsistence harvest of black bear in WAA 1527 has exceeded the subsistence harvest and seems to be increasing. Thus, access control and/or restrictions on the nonsubsistence harvest of black bear in WAA 1527 may need to be considered. Several of the action alternatives may improve hunter access, which would make the need to restrict nonsubsistence hunting even greater, but this need would exist even in the absence of the proposed action. It may be possible to disperse the nonsubsistence bear hunt throughout the Project Area, since as a whole it could sustain the documented average harvest. Steps still would have to be implemented to control future growth in demand for black bear.

The subsistence harvest of black bear from the Project Area can be considered to be stable or increasing at only a small rate. All community informants reported that the majority of black bear taken in the Project Area are harvested by nonsubsistence hunters. The documented in-

crease in nonsubsistence take of black bear in 1990-1991 may require some controls even in the absence of any further logging. Limited data does not allow the projection of "demand" for black bear from the Project Area, but there are reasons for concern and demand should be carefully monitored. Study community residents report that the black bear population seems to be very healthy, which is consistent with ADF&G and the modeling assumptions. These indicate that black bear populations benefit from timber harvest, at least in the short term.

Table 3-142
Summary Black Bear Harvest, Lab Bay Project Area by WAA, Year, and Subsistence/NonSubsistence

	WAA 1527		WAA 1528		WAA 1529		WAA 1530		TOTALS		
	Sub	Non-Sub	Sub	Non-Sub	Sub	Non-Sub	Sub	Non-Sub	Sub	Non-Sub	Total
1980/81	3	3	0	0	5	2	0	0	8	5	13
1981/82	4	5	0	0	0	2	0	0	4	7	11
1982/83	2	12	0	3	0	2	0	0	2	17	19
1983/84	5	9	1	2	1	2	0	0	7	13	20
1984/85	10	5	1	0	1	1	0	0	12	6	18
1985/86	5	13	1	0	2	0	0	0	8	13	21
1986/87	6	10	1	1	2	6	0	0	9	17	26
1987/88	9	14	1	0	3	4	0	0	13	18	31
1988/89	9	10	0	0	3	0	0	0	12	10	22
1989/90	1	4	1	3	2	4	0	2	4	13	17
1990/91	5	5	0	0	2	14	3	10	10	29	39
Totals	59	90	6	9	21	37	3	12	89	148	237
WAA Totals	**149**		**15**		**58**		**15**				
Average	5.36	8.18	0.55	0.82	1.91	3.36	0.27	1.09	8.09	13.45	21.55
Aver. by WAA	**13.55**		**1.36**		**5.27**		**1.36**				

Source: ADF&G — Note that harvest figures differ from those used in TLMP Draft Revision (1991a).

Table 3-143
Habitat Capability Model Estimates for Black Bear, Lab Bay Project Area (% of 1954 HC)

HCM Population Results	WAA 1527	WAA 1528	WAA 1529	WAA 1530	Project Area
1954	100	100	100	100	100
1990	96	95	95	89	93
1995	83	100	98	63	84
2004	92	95	93	91	92
Project Alternative	83	100	98	63	84
2040	82	83	70	78	77

Source: TLMP Draft Revision (1991a), Project Planning Record.

Marine Mammals

Federal law prohibits anyone other than Native Americans from taking marine mammals. There is no evidence that timber harvest activities have had any effects on marine mammal taken for subsistence, nor do harvest activities have any effect on marine mammal habitat. There are no Native American communities within the Project Area, and no marine mammals are taken on a regular basis near the Project Area.

Salmon

Salmon is a major subsistence food harvested in the Lab Bay Project Area. Concerns about potential effects on the fisheries resource were raised by the public during scoping. Specific concern included nearly every creek and bay in the Project Area, such as Merrifield Bay, Shine Creek, Buster Creek and Buster Bay, Red Bay, Salmon Bay, Exchange Cove, and the area around Thorne Island.

The Water Resources and Fisheries sections conclude that potential effects of the proposed timber harvest and road construction alternatives on salmon spawning and rearing habitat would be minimal or eliminated by applying the Forest Service standards, guidelines, and prescriptions described in detail in the Aquatic Habitat Management Handbook.

Based on the implementation of site-specific prescriptions for protecting salmon spawning and rearing habitat, the analysis projects that the immediate and foreseeable effects on the abundance and distribution of salmon for subsistence uses in the Project Area would not be measurable.

Other Finfish

The action alternatives would have no immediate or foreseeable effect on other finfish habitat, and the abundance and distribution of those other finfish would not be measurable.

Shellfish

Most of the action alternatives propose a Log Transfer Facility (LTF) in association with timber harvest on Thorne Island. This would affect a minimal portion of the marine and estuarine habitat of the Project Area. The effect of a LTF on benthic organisms generally is small (see discussion in Transportation section). Presence of the LTF probably would redirect the gathering efforts of some Whale Pass residents, but this also should be a relatively small effect. Based on this limited impact, the effect on the abundance and distribution of local shellfish would not be measurable for purposes of subsistence. The project effects for the foreseeable future would not be measurable.

Other Food Resources

Other foods include plants and berries of various kinds. Most such gathering occurs near beaches and estuarine areas. These areas are avoided by timber harvest units, although harvest may infringe upon gathering activities that extend beyond 500 feet of the shore. Road construction may improve access to berry-picking sites.

Since beach fringe and estuaries would not be significantly altered by the proposed alternatives, and additional gathering sites may be made available, the project effects and foreseeable effects are not expected to substantially change the abundance and distribution of other foods.

Firewood

The Forest Service has a free-use policy for firewood and timber and none of the proposed alternatives would have an adverse effect on the availability of firewood and personal-use timber.

Summary of Effects

Access

The Project Area is one of the most heavily roaded areas in southeast Alaska, and most hunting (both subsistence and nonsubsistence) depends upon road access. Most subsistence hunters

using the Project Area live elsewhere due to the development of the road system. In many areas, access by road has become the major mode of hunting, replacing access by boat. Thus in some respects road reconstruction and the building of new roads would continue the present pattern of subsistence use.

At the same time, some residents of Project Area communities, as well as hunters from Wrangell and Petersburg, rely on access by boat for much of their hunting. The areas they use are generally different from those of road-oriented hunters, although at times they use roads to gain access to backcountry areas. To the extent that roads are built in such areas, or change deer habitat characteristics, this group of subsistence users potentially would be adversely affected.

Two major areas where such effects are possible have been identified in the proposed alternatives. The proposed Calder Tie Road is a "loop" route which could increase access to hitherto unroaded portions of the Project Area and attract "new" hunters. Negative effects would be felt primarily by Point Baker and Port Protection, at least initially. If this access route attracted new hunters to the area, it is possible that all current subsistence hunters would be adversely affected by the increased competition. Whether the increased access would compensate for this is unknown. These effects could be mitigated by a road management policy which allowed local residents at least limited access, but closed the road to other vehicular traffic.

The second "road effect" area is a string of units proposed next to the Salmon Bay Lake LUD II. This has the potential to significantly increase road access and change the competitive hunting pressure. Closure of this road is proposed under the access management strategy. Even with restriction of vehicles, it is likely that the presence of roads would increase the use of this area. Since this is an area of limited deer habitat capability, deer harvest could be monitored to ensure that subsistence needs are being met. At some point, the nonsubsistence take of deer in WAA 1528 may need to be restricted due to increased access.

Competition

Implementation of an action alternative potentially affects all subsistence and nonsubsistence users. This is because a large percentage of Project Area deer are taken by nonsubsistence hunters and deer habitat capability is barely adequate to sustain the average documented harvest. Habitat degradation, increased demand, and increased access will produce a significant possibility of a significant restriction of subsistence uses. The main subsistence communities potentially affected would be Coffman Cove, Craig, Klawock, Point Baker, Port Protection, Whale Pass, and Wrangell.

Competition for deer has several components. The first is subsistence versus nonsubsistence take. Ketchikan harvests about 30 percent of the deer taken from the Project Area, which makes it more difficult for subsistence hunters to take their bag limit. By reducing habitat and increasing road access, the proposed action would continue this effect, increasing the "costs" in time and effort to subsistence hunters.

Competition also exists among different subsistence users. The common pattern on Prince of Wales Island is for an unroaded area to be lightly hunted. Once roaded for timber harvest, access is easier and use increases, especially as regrowth occurs and attracts feeding deer. This increase in hunting pressure usually displaces at least part of the pre-road hunting population to other unroaded areas. After ten years or so, the regrowth is too dense and too high to be useful for deer, so deer productivity falls off. Typically the harvest of nearby timber units keeps the cycle going with new roads and new units compensating for old units that have become unproductive for deer. In the meantime, more area has been converted to "road hunting." These areas are ultimately less productive deer habitat than what they replace, and it is because of this process that TLMP Draft Revision 1991a indicates that eventually deer habitat capability in the Project Area will not sustain the current level of harvest, and may or may not be able to sustain the subsistence harvest.

The Federal Subsistence Board may use its authority to restrict nonsubsistence harvest of deer and to prioritize the harvest of deer among subsistence users when necessary to protect the

resource. This type of action, as prescribed by ANILCA, Section 804, may be necessary to ensure the availability of deer for the subsistence communities using the Project Area whether or not the proposed actions are implemented.

Black bear is another resource affected by competition. The habitat capability in WAA 1527 is adequate only to support the documented subsistence bear harvest on a sustained yield basis, primarily because of limited habitat and an increase in nonsubsistence hunter effort. The Federal Subsistence Board may need to restrict nonsubsistence black bear hunting in WAA 1527.

There is no evidence to indicate that salmon, finfish, shellfish, or other food resources available to subsistence users would be affected by sport or nonsubsistence harvest. Increased competition would not be substantial because of the availability of resources in the immediate vicinity and in surrounding areas.

Individual household and even community use of specific areas may be displaced by some of the proposed actions. There is not sufficient information available, nor would it be practical to evaluate displacement potential for individual households. While some areas are better for subsistence than others, it is unlikely that an individual household or even a community is highly dependent on specific units within the Project Area that may be affected by the proposed alternatives. Generally, there are sufficient lands available elsewhere within or outside the Project Area for subsistence hunting and gathering.

Because there may be a restriction on the subsistence use of deer, the Subsistence Resource Report (Project Planning Record) discusses the historical harvest of deer for each community. Native residents of Klawock, in the southern part of Prince of Wales Island, have the longest established record of use of the area. There appears to be an adequate deer abundance in the short term (until 2004) within the area historically used by residents of each community to meet subsistence needs. Any displacement that may occur is likely to be to other areas within a household's or community's historical range.

Cumulative Effects Summary

The evaluation of cumulative effects for subsistence resources determines whether or not future activities may restrict subsistence uses, and identifies which rural communities that use the Project Area would be most affected by a restriction.

Based on projected future timber harvest, approximately 4,549 acres would be harvested in the Project Area by 2004. The Wildlife section projects that this level of harvest would reduce the habitat capability of several species and could affect their abundance and distribution. Relative to habitat capability projected for 1954, the potential deer habitat capability by the year 2004 is projected to decrease cumulatively by about 34 percent, potential marten habitat by about 19 percent, potential black bear habitat by about 4 percent, and potential otter habitat by about 18 percent.

Decreases in abundance could increase competition for the species important for subsistence. Future reductions in habitat capability and deer populations due to timber harvest would exacerbate the potential conflict between subsistence harvest and nonsubsistence harvest of deer. In addition, subsistence hunters may need to make changes in their hunting techniques, locations, and/or time to remain successful. These possibilities support the conclusion that the subsistence use of deer in the Project Area may be restricted by implementation of an action alternative.

Actions on lands surrounding the Project Area could also affect the abundance, distribution, access to, and competition for subsistence resources harvested by the Project Area communities. Such actions include timber harvest on private lands, the Central Prince of Wales, Control Lake and the Polk Inlet timber sales. Enough is known about foreseeable activities on other lands surrounding the Project Area to project that subsistence use of deer may be significantly restricted in the future. Subsistence use of black bear may also be significantly restricted. Subsistence use of salmon, other finfish, or other resources in the Project Area is not expected to be significantly restricted.

Summary of Findings for Other Resources

Alternatives 1 through 5 may potentially significantly restrict the subsistence use of deer, black bear, and otter (Tables 3-136, 3-144, 3-145). Only the restrictions on deer under Alternatives 2 and 5 would be the direct result of the proposed alternatives. The effects upon black bear are due to increased competition from nonsubsistence hunters, and the otter effects are due to a low initial habitat capability and a high historical harvest.

It does not appear that actions proposed in Alternatives 1 through 5 would significantly restrict the subsistence use of other furbearers, waterfowl, marine mammals, salmon, other finfish, shellfish, or other subsistence resources in the Project Area (Tables 3-146 and 3-147). This finding is based on the potential resource effects by the three evaluation categories: abundance and distribution, access, and competition.

Table 3-144
Potential for Restriction of Black Bear Subsistence Use

Effect	Alternative 1	2	3	4	5	6
Abundance or Distribution	No	No	No	No	No	No
Access	No	No	No	No	No	No
Competition	Yes	Yes	Yes	Yes	Yes	Yes

Source: Galginaitis 1993

Table 3-145
Potential for Restriction of Otter Subsistence Use

Effect	Alternative 1	2	3	4	5	6
Abundance or Distribution	Yes	Yes	Yes	Yes	Yes	Yes
Access	No	No	No	No	No	No
Competition	No	No	No	No	No	No

Source: Galginaitis 1993

Table 3-146
Restriction of Fishery Subsistence Use

Effect	Alternative 1	2	3	4	5	6
Abundance or Distribution	No	No	No	No	No	No
Access	No	No	No	No	No	No
Competition	No	No	No	No	No	No

Source: Galginaitis 1993

Table 3-147
Potential for Restrictions of Other Subsistence Resources

	Alternative					
Effect	1	2	3	4	5	6
Abundance or Distribution	No	No	No	No	No	No
Access	No	No	No	No	No	No
Competition	No	No	No	No	No	No

Source: Galginaitis 1993

Other Conclusions

Section 810 (a) (3) of ANILCA requires that when a significant restriction may occur, determinations must be made in regard to whether:

- Such a significant restriction of subsistence uses is necessary, consistent with sound management principles for the utilization of public lands;
- The proposed activity will involve the minimum amount of public land necessary to accomplish the purposes of such use, or other disposition;
- Reasonable steps will be taken to minimize adverse effects upon subsistence uses and resources resulting from such actions.

Necessary, Consistent with Sound Management of Public Lands

The alternatives proposed for the Lab Bay Project have been examined to determine whether they are necessary, consistent with sound management of the public lands. The National Forest Management Act of 1976 (the Act), the ANILCA, the Alaska Regional Guide, the TLMP, the TLMP 1985-86 Amendment, the Alaska State Forest Practices Act, and the Alaska Coastal Zone Management Program have been considered.

The ANILCA placed an emphasis on the maintenance of subsistence resources and lifestyles. However, the Act also required the Forest Service to make a target amount of timber available per decade from the Tongass National Forest and left the KPC contract in place. The TTRA removed the timber target requirement from ANILCA; directed the Forest Service to seek to provide a Tongass timber supply to meet market demand to the extent consistent with providing for the multiple use and sustained yield of all renewable forest resources. The TTRA left the volume requirements and contract area of the KPC contract in place.

The alternatives presented here encompass five different approaches that would produce the resources that would best meet the needs of the American people, help achieve multiple use management objectives in the TLMP, and help meet KPC contract obligations. All of the action alternatives involve some potential impact to subsistence uses. There is no alternative that would meet KPC contract requirements and TLMP objectives and still avoid a significant restriction of subsistence uses somewhere in the Tongass National Forest. Therefore, these actions are necessary, consistent with the sound management of public lands.

Amount of Public Land Necessary to Accomplish the Purpose of the Proposed Action

Much of the Tongass National Forest is used by one or more rural community for subsistence deer hunting. The areas of heaviest and most frequent use are those adjacent to roads, beaches, and in close proximity to communities. Within the Lab Bay Project Area, the extent and location of subsistence use areas precludes complete avoidance. Other areas that could be harvested for timber may be limited by other resource constraints such as soils, economics, visual concerns, or unit and road design constraints. Effort was taken to protect the highest value subsistence areas.

For example, beach fringe is one of the highest use subsistence areas and none would be harvested under the proposed alternatives with the exception of Alternatives 4 and 6. Under Alternatives 4 and 6, Thorne Island would be harvested using an uneven-aged management plan. A total of 36 acres of beach fringe habitat would be harvested as a series of 2-acre patch cuts. Functions and values of the beach fringe habitat are expected to be maintained.

It is not possible to lessen harvest in one geographical area and concentrate it in another without affecting the subsistence use areas of one or more communities. In addition, harvestable populations of game species could not be maintained in a natural distribution across the Forest if harvest were concentrated only in confined areas. A well-distributed population of species is also required by the Forest Service regulations implementing the National Forest Management Act. Therefore, based on the analysis of the proposed alternatives, these actions are found to use the minimum amount of land necessary to accomplish the purpose of the proposed action, moving the Forest closer to the desired future condition.

Reasonable Steps to Minimize Adverse Impacts Upon Subsistence Uses and Resources

Reasonable steps to minimize adverse impacts upon subsistence uses and resources have been incorporated in the development of the alternatives and project design criteria. During the development of the alternatives, every effort was made to minimize activities that could adversely impact important subsistence use areas. Unit layout called for locating roads and units outside of important subsistence use areas such as beach fringe, estuary fringe (with the exception of Alternatives 4 and 6, as described above), and riparian areas.

Conclusions

The Record of Decision (ROD) for the Lab Bay Project will include a final determination about the significant restriction on subsistence uses and resources that may result from implementation of the selected alternative. Below is a summary of the EIS evaluation and findings.

1. The reasonably foreseeable effects from the Lab Bay Project action alternatives would not significantly restrict the subsistence use of furbearers (other than otter), waterfowl, marine mammals, salmon, other finfish, shellfish, or other subsistence resources in the Project Area.

2. The reasonably foreseeable effects from <u>all</u> alternatives in the Lab Bay Project (including the No Action alternative) may significantly restrict the subsistence use of otter. These effects are primarily due to existing conditions and would not be the result of the proposed actions.

3. The reasonably foreseeable effects from <u>all</u> alternatives (including the No Action alternative) may significantly restrict the subsistence use of black bear. These effects are primarily due to existing conditions and would not be the result of the proposed actions.

4. The reasonably foreseeable effects from <u>all</u> alternatives (including the No Action alternative) may significantly restrict the subsistence use of deer for residents of the communities of Coffman Cove, Craig, Klawock, Point Baker, Port Protection, Whale Pass, and Wrangell. Point Baker, Port Protection, and to a smaller extent Whale Pass are most susceptible to restrictions upon the subsistence use of deer because of their relatively small primary use areas, their preferred means of access, and the effort that would be required for them to access other areas. These effects are due to habitat degradation, projected increases in demand for deer, and the cumulative effects of previous harvest.

5. Ketchikan is a nonrural community and thus potential effects of the proposed action upon Ketchikan hunters is not a subsistence or ANILCA concern. Nonetheless, analysis indicates that effects on Ketchikan hunters are likely to be significant. As the availability of deer in the Project Area decreases, a subsistence priority for deer harvest may need to be invoked.

Hearings

On the basis of the findings of this analysis and under the provisions of ANILCA, subsistence hearings were held in the Project Area. The communities where hearings were held include Coffman Cove, Craig, Klawock, Point Baker/Port Protection, Whale Pass, and Wrangell. Both written and verbal testimony was taken at the hearings. Testimony received has been incorporated into this Final EIS.

Monitoring

The Forest Plan recognizes three distinct types of monitoring: implementation, effectiveness, and validation. Implementation monitoring determines if projects and activities comply with Forest Plan standards and guidelines. Effectiveness monitoring determines whether the standards and guidelines achieve the desired results. Validation monitoring determines whether the assumptions in the Forest Plan regarding the relationship between management actions and their effects are correct, or if there is a better way to depict these relationships.

A monitoring plan has been developed for the Tongass National Forest by the Forest Planning Team and is described in the TLMP Draft Revision (1991a).

Cultural Resources

Tlingit 19th century carved and engraved finial.

Key Terms

A.H.R.S. - Alaska Heritage Resource Survey, a database housed at the Office of History and Archaeology, Alaska Division of Parks, Department of Natural Resources.

B.P. - Before Present, defined as radiocarbon years before 1950.

Cultural Resources - Evidence of past human-related activity, dating from the earliest occupation of the area to as recent as 50 years ago. Cultural resources which Forest Service guidelines direct to be formally recorded and evaluated are sites such as shell middens, fish traps, villages, mines, and canneries.

CMT's - Culturally Modified Trees are trees which 1) have had bark removed for use in basketry or other items, or to get at the edible cambium layer, or 2) have been deeply notched to hold bait and traps for pine martens. According to Forest Service guidelines, CMT's are not recorded as cultural resource sites unless a large number are found in a limited area.

Ethnography - The descriptive study of aspects of human cultural adaptations.

Eulachon - Oolican or candlefish, a species of smelt caught during spring runs in large streams, estuaries or bays. The fish was and is an important source of oil for native human populations.

Midden - A pile or mound of cultural material (shell, bone, stone, charcoal, or wood) usually resulting from human habitation in one area for an extended period of time.

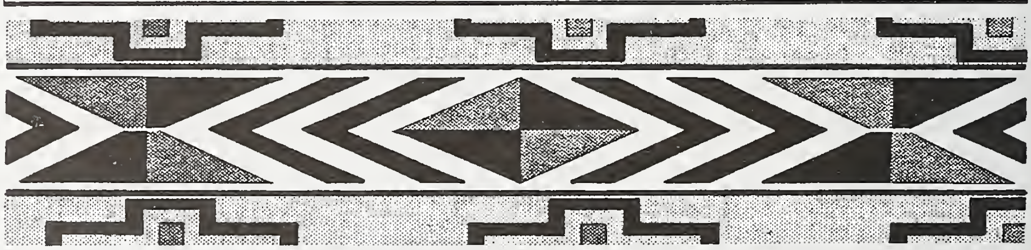
Paleontological - The remains of animals that may or may not be fossilized, but are recovered in deposits not resulting from human activity.

PET - An abbreviation for the Petersburg 1:250,000 quadrangle and part of the designation assigned to each archaeological or historic site located within that quadrangle.

Petroglyphs - Carvings or incised designs on rock.

Potlatch - Describes a ceremonial feast held among the Northwest Coast Indian Tribes and during which the host distributes gifts, a gesture requiring reciprocation.

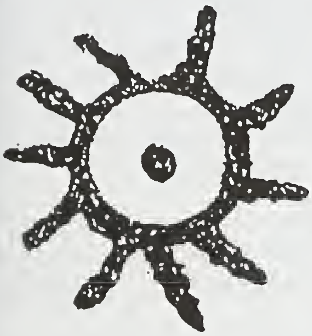
Sensitivity Zone - Classification of landforms according to their probability for containing cultural resources. "High" probability areas for cultural resources in the Ketchikan Area are considered to be lands less than 100 feet above mean sea level (amsl) and along shores or adjacent to lakes and anadromous fish streams within the first 100 feet of elevation. "Low" probability areas are any lands with greater than 35 percent slope regardless of elevation, all muskeg areas, and all lands above 100 feet amsl. Recently, cultural resources have been documented in areas not totally factored into the predictive model, but currently considered as having a high probability of containing cultural resources. These areas include karst topography, natural pass areas, known historic mining areas, and traditional/religious properties, all of which can occur at any elevation.



A repeat pattern from a Tlingit basket from the 19th to 20th century.

Affected Environment

Portions of the Lab Bay Project Area were apparently free from glacial ice at least 11,000 years ago, based on radiocarbon dates of paleontological remains. Until recently, evidence of human occupation of North Prince of Wales Island did not predate 5,000 years ago, but earlier occupations had been documented as near as Coffman Cove to the southeast of the Project Area. Human bones discovered in a cave in the Project Area were recently dated to 9730 ± 60 years B.P.



Tlingit petroglyph of the sun, locality unknown. (Sketched by G.T. Emmons around the turn of the century)

The Paleomarine Tradition (10,000-6,500 B.P.) is the earliest recognized cultural tradition in the area. Sites or components of sites assigned to this tradition contain microblades, wedge-shaped microblade cores, and few or no bifacially flaked stone tools. Animal remains at these sites include fish bone and marine shell, indicating a coastal marine subsistence (Davis 1990). A site identified at Thorne River is the only site on Prince of Wales Island assigned to the Paleomarine Tradition. The Thorne River site contains an artifact assemblage of microblades and cores, burins, choppers, and other types of tools and flakes considered to fall within this early tradition (Holmes 1989).

The Transitional Stage (6,500-5,000 B.P.) represents a period of change between the technology evidenced in the Paleomarine Tradition and that of the later Developmental Northwest Coast Tradition. Faunal and floral remains and the inland location of some sites suggest adaptation to a changing environment (Davis 1990).

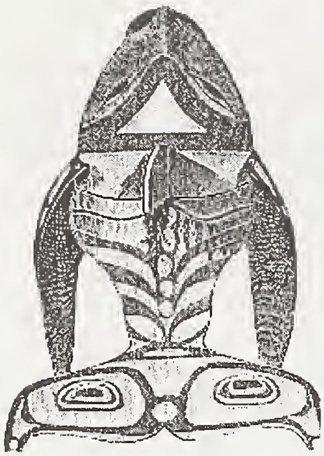
The Developmental Northwest Coast Tradition (5,000 B.P. to contact) contains multiple phases and is distinguished from the Transitional Stage by shell midden deposits, ground stone and bone technology, human burials, the establishment of larger settlements (winter villages), specialized subsistence camps, fortifications, and the use of native metal (Davis 1990). Sites at Coffman Cove, Sarkar Cove, and the Yatuk Creek Rockshelter in the central portion of Prince of Wales all contain components from this tradition (Arndt et al. 1987; Clark 1979a, 1979b, and 1980; Rabich Campbell 1984). It is possible that the beginning of this tradition corresponds with the entry of the contemporary native population, known as the Tlingit, into the area.

Ethnography

Although the exact dates of occupation are not known, the Tlingit were well established in Southeast Alaska by the time of first Russian contact in 1741. The Tlingit culture is united by common custom and tradition rather than any political organization, and the Southern Tlingit are those tribal members who traditionally occupy the islands of Southeast Alaska south of Frederick Sound (De Laguna 1990).

Prince of Wales Island was formerly divided among several subgroups of Tlingits: the Stikine (Shtax'heen Kwaan) included the northeast coast in their territory; the Henya (Heinyaa Kwaan) inhabited the northern half of the western part the island; the Klawock (Lawaak Kwaan), who may always have been part of the Henya, resided along the west central coast; and the Tongass (Taant'akwaan) held the southern third of the island before the Kaigani Haida displaced them (about 1700 A.D.) to a small section along the Southeast coastline and islands to the east (Arndt et al. 1987).

The settlement and subsistence patterns of the Tlingit demonstrate a long-term adaptation to their environment. Generally, their annual subsistence cycle has been described as: early spring hunting or trapping of mammals on the mainland, halibut fishing in deep waters, eulachon fishing along streams, and shellfish and seaweed gathering in shallows; late spring sea otter and fur seal hunting, herring spawn gathering and Chinook salmon fishing; summer intensive salmon fishing and curing, along with berrying by most groups, and harbor seal hunting by northern groups; and fall sea otter hunting, berrying, and perhaps hunting of interior game animals. Relying upon stored foods, the Tlingit generally viewed winter as a time for potlatches and trading, rather than for formal subsistence pursuits. In earlier times, summer was also a time for warring to capture slaves and for a certain amount of trading (Arndt et al. 1987, De Laguna 1990).



Top view of a Haida killer-whale mask collected on Prince of Wales Island.

Each Tlingit clan or tribe occupied at least one main village in the winter. The villages were established as near as possible to many different seasonally available resources. Key features included: bays with protection from the elements; a view for watching for potential raids; fresh water streams for salmon fishing, as well as drinking water; and other resources such as good timber, clam beds, berry patches and hunting grounds. As the seasons progressed, hunting, fishing, or gathering groups would leave the main village for temporary camps along beaches or in the interior, or for more formal seasonal villages in prime salmon locations. The seasonal villages would often be occupied from mid-summer through early fall in order to obtain large quantities of salmon for storage (Arndt et al. 1987, De Laguna 1990).

Beginning in the mid-eighteenth century, Russian, British, French and American explorers and fur traders established contact with the Tlingit of Prince of Wales Island. With the presence of the Russians came trading posts, and while the native population acquired foreign goods, they also maintained their independence.

The introduction of European diseases had a significant effect on Native Alaskans. Smallpox was the greatest killer, but typhoid and measles also played major, though less well-documented roles. Survivors of the severe smallpox epidemic of 1835-38 moved from small villages to larger ones (De Laguna 1972, 1990). This consolidation likely occurred on Prince of Wales Island resulting in the abandonment of traditional villages.

Following the purchase of Alaska by the United States in 1867, a dramatic change occurred in the lives of the Tlingit with the establishment of the first cannery on the island at Klawock in 1878 (Selkregg 1976). The next nonnative development in the area was a substantial mining effort, followed finally by the timber industry. The introduction of these industries saw many natives leave their traditional subsistence way of life for wage labor (Arndt et al. 1987, De Laguna 1990). Logging, mining, and the development of cottage industries to accommodate a growing tourist market also provided opportunities for natives to work for pay.

As supported by written records and archaeological evidence, the effect of acculturation on the Tlingit way of life was not a major factor until the influence of American industry in the late nineteenth century. The 1890 census reported up to 50 natives employed at each of the salteries at Red, Salmon, and Lake Bays, with the settlements abandoned in the winter (USDI Census Office 1893). By 1900, native people had shifted from their traditional subsistence way of life to relocating for wage labor. In the 1930's, the Indian Reorganization Act incorporated some villages and aided them in acquiring land and sawmills (De Laguna 1990). Although industry brought about changes in the life ways of the Tlingits, resulting in a decline in traditional values, tribal identity has not been lost. The clan system, singing and dancing, native crafts, and death customs have experienced a strong revival since the 1970's.

History

The first two decades of fishing and canning in the northern portion of Prince of Wales Island were largely unmonitored, but beginning in 1897 the U.S. Fish Commission compiled reports on salmon-related activities in the area. An early report listed Thomas McCauley as having exclusive fishing claims on the northeast side of Prince of Wales Island. The report indicated that salteries previously had been established at Red Bay, Salmon Bay, and Whale Passage by Mr. McCauley, but that they were soon consolidated into the one operation at Whale Passage (House Document 308, 1899).

One of the last reports about the immediate project area is a Department of Commerce and Labor Bulletin regarding coho salmon fishing in Salmon Bay from 1904-1906 and at Whale Passage in 1905 and 1906 (House Document 356, 1907). While actual fishing was taking place offshore and in the streams of Prince of Wales Island, the industry brought people, buildings and work to the island. As mentioned, the native Tlingit went to work for the canneries, moving from their native villages to settlements around the canneries (De Laguna 1990). Thus, the fishing industry played a large role in the acculturation of the Tlingit and their shift from a subsistence way of life to that of wage labor.

In the late nineteenth century, prospectors discovered that Southeast Alaska was rich in industrial minerals, or nonmetallic, non-fuel resources used in industry and construction. The first discovery was marble, and three quarries were eventually established in the North Prince of Wales area. The sale and production of marble from southeast Alaska steadily increased from 1904 to 1926, but by 1932, demand was no longer great enough to keep the Southeast Alaska quarries open (Roppel 1991).

The logging industry has also had significant effects on Southeast Alaska, the physical remains of which can still be seen in the North Prince of Wales area. The history of the federal presence in the forests of Alaska began during the presidency of Theodore Roosevelt and continues to this day.

From the beginning of his presidency in 1901, Theodore Roosevelt was interested in the possibility of creating forest reserves in Alaska, and the President asked renowned Alaskan expert Lt. George Thornton Emmons to prepare a report on the potential of such an undertaking. Emmons recommended that several areas of Southeast Alaska be considered, including Prince of Wales Island. In 1902, a presidential proclamation reserved the lands that Emmons suggested and the Alexander Archipelago Forest Reserve was created (Arndt et al. 1987, Rakestraw 1981).

During that time, the population of the Forest Reserve was limited largely to native populations and employees of the mining and fishing industries. On Prince of Wales Island, both the mining and fishing industries used the timber. The miners used it for buildings and railroads, and the fishing industry for wharves, buildings and netting constructions. While no sawmills were located in the Lab Bay Project Area, just to the south in Shakan, a mill was operating in 1905, gearing its output to mining and fishing construction (Rakestraw 1981).

In July of 1908, the Tongass National Forest assumed control of the Alexander Archipelago Forest Reserve with a combined area totaling 6.2 million acres. After that time, the timber sales from the area grew along with the salmon fishing. The people living on or near the Tongass National Forest peacefully coexisted with its administrators and the management practices of the forest and timber sales through the first half of the twentieth century. Timber sales from the area flourished from the 1920's through the 1940's, due in part to demands by Civilian Conservation Corps work projects and, later, World War II. While pulp production had been attempted at an earlier date, it was not until after World War II that large-scale pulp production became feasible in Southeast Alaska, once again increasing timber sales and production in the area (Arndt et al. 1987, Rakestraw 1981).

The forests of Prince of Wales Island have long proven useful for residents of the island, as well as for industries. The native Tlingit used the trees for building homes and making canoes, and they hunted in the forests from the beginning of their occupation. The influx of mining, quarrying, and fishing industries with European and American backing increased the need for processed lumber, which led to construction of sawmills in the immediate vicinity to meet these needs. With the establishment of the area as part of the Tongass National Forest, lumber interest turned from the private sector to the public and from serving residents to an export market.

Through the years, the Forest Service has constructed buildings in various parts of Prince of Wales Island and continues its residency of Tongass National Forest to this day, administering the forest and its timber sales. Little physical evidence of the historic occupation or of day-to-day activities of the Forest Service is evident, with timber harvest units being the primary physical remainder (Arndt et al. 1987).

Tlingit totem poles in Klawock.

Summary of Existing Resources

The objective for the cultural resource specialists on the Lab Bay Project was to satisfy Section 106 of the National Historic Preservation Act of 1966 and the National Environmental Policy Act requirements for cultural resources potentially affected by the proposed action. The initial task was development of a cultural resource inventory plan (Greiser 1992), consistent with Forest Service Manual 2300 and AHRS guidelines. The inventory plan included pedestrian (walk through) examination of the ground surface, along with subsurface investigation where necessary to assess the potential for significant resources in the Lab Bay Project Area.

Ceremonial skin tunic, Tlingit tribe

A technical study then was performed which included the following objectives:

- To inventory known cultural resources through background research; locate additional sites in the Project Area through a complete survey of proposed cutting units and roads in high probability areas; survey additional blocks of land outside cutting units in high probability areas; and attempt to relocate previously recorded sites for detailed recording and evaluation in areas that might be subjected to increased activity.
- To evaluate the significance of located cultural resource sites in terms of the National Register of Historic Places criteria.
- To determine the potential effects of each project alternative on significant sites and compare effects among the alternatives.
- To recommend measures to mitigate impacts of potentially adverse effects on significant resources and discuss the possible effectiveness of the measures.

Results of Background Research

Four categories of reported or known cultural resources were identified through research of AHRS and Forest Service files:

1. Properties that have been well documented through intensive cultural resource inventories and field recording.
2. Properties that have been located as part of a cultural resource inventory but not intensively recorded.
3. Properties that have been identified and field checked under provisions of the Alaska Native Claims Settlement Act of 1971 (Sealaska Corporation 1975).
4. Properties that have been identified on the basis of reports in the literature or locations marked on historic maps.

The field team considered resources in the last category to be "leads", the existence and location of which would be confirmed through field work and detailed recording. At a minimum, most known cultural resources required additional work sufficient to make statements of eligibility for listing in the National Register of Historic Places (National Register).

Reported site and feature types targeted for field verification in the Project Area included Native villages, Euroamerican villages, burials/cemeteries, petroglyphs, salteries/canneries, cabins, wood/stone fish weirs, caves, middens, mines/quarries and gardens. Additionally, field examination included culturally modified trees, although these have not been recorded as properties or sites.

Description of Field Methods

The Research Design/Predictive Model Format for the Ketchikan Area prepared by the Forest Service defines high and low sensitivity zones based upon the probability that they may contain significant cultural resources (Autrey et al. 1992). It was estimated that the intensive cultural resource inventory would approximate 2,000 acres within the Area of Potential Effect for this Project, North Prince of Wales Island north of Neck Lake and Thorne Island. Based on acreage figures generated as part of the preliminary plan, the cutting units proposed for inventory due to their location within defined high probability areas contained a total of about 1,300 acres. As surveys in proposed cutting units and along proposed roads in high probability areas neared completion, additional acreage was selected from high probability zones on Prince of Wales or Thorne Island. The additional acreage was selected with the objective of relocating and evaluating previously recorded sites that might be subjected to increased human activity such as recreation or vandalism as a result of the proposed logging.

The inventory was conducted according to the methods for survey and recordation specified in FSM 2300 and other Forest Service cultural resources survey standards including the Ketchikan Area Research/Survey Design. Cultural resource personnel were variably divided into two or three crews on a daily basis, dependent on the location and logistical requirements of the par-

ticular areas to be surveyed. The types of anticipated cultural resources were reviewed with field personnel from other disciplines and they were encouraged to report their observations. Access to inventory areas from the base at Labouchere Bay was achieved by trucks, motorboats, canoe, or helicopter.

Typically, the proposed cutting units and roads selected for inventory were combined with nearby coastal areas for survey. Intertidal areas were examined around low tide, primarily for the presence of fish traps and weirs. Higher ground, including the proposed cutting areas, was investigated during periods of high tide. During the second half of fieldwork, as the proposed cutting units and roads in high probability areas were completed, more inventory was conducted along shoreline areas. This resulted in an increase in the number of cultural resource sites located and recorded.

Basic survey methods involved crew members walking transects no greater than 30 meters (m) apart. Above the intertidal zone, 2.5-centimeter (cm) diameter soil probes with Oakfield soil augers were made at least every 50m in level areas, but more frequently in high probability areas where subsurface soil exposures were lacking and bedrock was not present. Likely landforms were probed intensively, and all exposures such as wind thrown tree roots (root wads) and cut banks were examined. Within the intertidal zone, transect intervals tended to expand and contract as necessitated by irregular shorelines and obstacles such as tributaries.

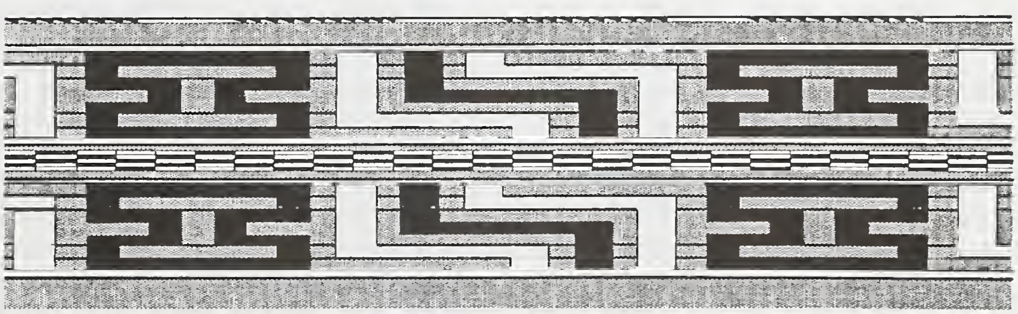
Shovel tests were used at appropriate locations within cultural resource sites to obtain information for evaluation of National Register of Historic Places eligibility. Shovel tests were generally 0.5m by 0.5m square and excavated in 10cm increments, with the excavated matrix screened or troweled for cultural material, which was then collected. The field teams excavated shovel tests to a minimum depth of 0.5m unless they encountered sterile deposits or materials that could not be penetrated.

Sites, culturally modified trees (CMT's), and isolated artifacts were photographed and accurately located on color copies of 1:1,320-scale 1991 aerial photographs, with site locations transferred to U.S. Geological Survey (USGS) 15-minute (1:63,360) quadrangle maps. Cultural resource sites were recorded on Forest Service Site Inventory Records, fish weirs were also recorded on Fish Trap Field Survey Forms, and CMT's were recorded on Culturally Modified Tree Records. The recording procedures were designed to document, to the extent practical, the observable cultural and related natural phenomena. The recording team drew sketch maps of cultural sites to scale, based on compass bearings and paced or measured dimensions.

During the Lab Bay Project cultural resources inventory, cultural resource personnel intensively surveyed approximately 2,655 acres, while approximately 1,545 acres were reviewed at the reconnaissance level. No traditional cultural/religious properties were identified by local native groups.

Results of Field Inventories

Background research resulted in the tabulation of 36 documented or reported cultural or paleontological resource sites from AHRS and Forest Service records. In addition, there are seven mine claims (U.S. Bureau of Mines n.d.) and one unconfirmed aboriginal burial site (Sealaska 1975) reported for the Project Area. Field work conducted as part of the Lab Bay EIS research confirmed eight of the previously known sites and documented an additional nine sites in the Project Area. No new traditional cultural/religious properties were identified as a result of the



Pattern from a Tlingit 19th century straight-sided basket. The horizontal stripes and borders are produced in the weaving, with other elements superimposed in false embroidery.

current project. All currently known cultural and paleontological resource sites, plus the unconfirmed sites, are summarized in Table 3-148.

In two different cases, two sites were combined into a single site. In the first case, archaeologists already recognized PET-126/181 as being two parts of the same site. In the second, it was determined that PET-127/187 likely constitutes a single site, although no evidence for PET-127 could be located on the ground. Archaeologists noted previously that road construction had largely destroyed PET 127, with only some iron stove parts and glass bottle fragments remaining. Finally, field crews attempted to relocate two reported sites, neither of which could be found, due possibly to incorrect map location (PET-129) or to subsequent erosion or deposition covering the site (PET-180).

Table 3-148
Known Sites Within the Study Area

VCU	AHRS Number	Cultural Affiliation	National Register Eligibility Recommendation
527	PET-207[1] (Includes PET-332, PET-333, & PET 334)	Aboriginal	Eligible
527	PET-408[6]	Paleontological	None
528	MN-05[5]	Historic	None
528.1	PET-179	Aboriginal/Historic	None
528.1	PET-329[2]	Aboriginal	Eligible
528.1	Sealaska 436	Aboriginal	None
530	PET-205[1]	Aboriginal	Eligible
531	MN-07[5]	Historic	None
531	MN-09[5]	Historic	None
531.1	PET-003	Historic	None
531.1	PET-008	Historic	None
531.1	PET-180[3]	Aboriginal	None
531.1	PET-188	Historic	None
531.1	PET-323	Aboriginal	None
531.1	PET-204[1]	Historic	Eligible
531.1	PET-210[6]	Aboriginal	None
531.1	PET-407[6]	Paleontological	None
532	PET-125[2]	Aboriginal	Eligible
532	PET-126/181[2]	Aboriginal	Eligible
532	PET-127/187[2]	Aboriginal	Eligible
532	PET-129[3]	Historic	None
532	PET-201[1]	Aboriginal/Historic	Eligible
532	PET-202[1]	Aboriginal	Eligible
532	PET-203[1]	Aboriginal	Eligible
532	MN-02[5]	Historic	None
533	PET-128[2]	Aboriginal	Eligible
534	MN-01[5]	Historic	None
534	MN-06[5]	Historic	None
534.3	PET-038	Historic	None

Tlingit 19th century carved knife in steel, copper, and wood.

Table 3-148 (Continued)
Known Sites Within the Study Area

VCU	AHRS Number	Cultural Affiliation	National Register Eligibility Recommendation
534.3	PET-182	Aboriginal	None
534.3	PET-183	Historic	None
534.3	PET-184	Aboriginal	None
534.3	PET-185	Aboriginal	None
534.3	PET-186	Aboriginal	None
536	PET-189	Aboriginal	None
536	PET-190	Paleontological	None
536	PET-318	Historic	None
536	MN-10[5]	Historic	None
537.1	PET-317[2]	Aboriginal	Ineligible
537.1	PET-220[6]	Paleontological	None
537.1	PET-221[6]	Paleontological	None
538	PET-072	Aboriginal	None
538	PET-107	Aboriginal	None
538	PET-121	Aboriginal	None
538	PET-174	Aboriginal	None
538	PET-175	Aboriginal	None
538	PET-176	Aboriginal	None
538	PET-321	Aboriginal	None
538	PET-206[1]	Aboriginal	Eligible
538	PET-222[6]	Aboriginal	None
539	PET-319[4]	Aboriginal	Eligible
551	PET-208[1]	Aboriginal	Eligible
551	PET-209[1]	Aboriginal	Eligible
551	PET-225[6]	Aboriginal	None

1 Site located and recorded as part of current study.

2 Previously located sites confirmed and evaluated as part of current study.

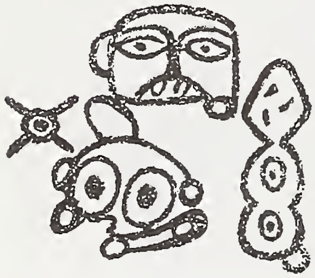
3 Previously located site searched for, but not confirmed as part of current study.

4 Previously located site evaluated as part of current study.

5 Mining claim.

6 Located by archaeologists or paleontologists since 1992 fieldwork.

The reported resource sites include: three paleontological sites, one with coral fossils and two containing early Holocene animal remains; a rock with petroglyphs in Whale Passage; a camp in the same cave complex as the paleontological material; 12 fish weirs, all but one of which are of the wooden stake variety; 18 shell midden deposits, three with reported garden furrows and one associated with a possible wooden stake fish weir; two salteries, one with an associated stone fish weir and the other with a shell midden; four historic habitation locations, one of which was probably a floating structure; two mining-related sites, one with a related townsite; and a cemetery.



A grouping of Tlingit petroglyphs on a boulder, consisting of a human face, a starfish, and two unidentified creatures; locality unknown (Sketched by G. T. Emmons)

The development of fish canneries and salteries during the late 19th century drew natives from their traditional villages to establish new settlements or to expand old summer or winter camps near the places of work. Several salteries were located on Prince of Wales Island, including three on the north and east coasts of the island. Early observers reported a saltery in Red Bay and structural remains found and recorded as PET 129 were assumed to be part of this facility. A native village site (PET 038) recorded at Salmon Bay, is also reportedly the site of a saltery active from at least 1884 to 1897. Cultural resource surveys have documented extensive human use along the entire shoreline of Salmon Bay (Ream and Saleeby 1987). The third saltery was located near the head of Whale Passage, where three shell midden deposits (PET-072, PET-121 and PET-174) and a petroglyph (PET-107) are reported. While previously recorded sites support the theory of Tlingit resettlement near canneries and salteries, further archaeological documentation is necessary to prove it.

Previous researchers identified two abandoned towns in or near the southwestern part of the Project Area. A native village (PET 179) located at the northerly limit of Shakan Bay, outside the Project Area, has not been field verified. The other confirmed town is old Calder (PET 003), established in 1904 in conjunction with marble quarrying in the area. Old Calder was apparently a Euroamerican rather than native town and may have been inhabited for two decades or less (Ream and Saleeby 1987). The Shakan Strait Burial site (PET 008) is at least partially historic since a headstone dated 1900 was found.

Only one (PET-317) of the 15 sites more fully recorded and evaluated during the 1992 fieldwork is ineligible for listing in the National Register of Historic Places. This reported stone fish weir site appears to have suffered disturbance since its initial recording and is no longer sufficiently intact for further research or interpretation. In addition, the isolated culturally modified trees recorded during the current Project are not considered to be eligible for the National Register.

Effects of the Alternatives

Documentation of cultural resources, with preservation and protection of National Register eligible resources, are general Forest Service objectives for such undertakings as the current Project. Where avoidance and *in situ* preservation are not viable management options, then measures are implemented to recover data as a way of mitigating effects to significant cultural resource sites.

Direct effects to cultural resources result from activities such as road building, logging or construction of log transfer facilities. Natural processes, such as erosion and redeposition, can also adversely affect cultural resources. These can be accelerated as a result of logging-related activities. Indirect effects to resources, such as increased access to an area or change in stream flow or sediment loads, may result from timber harvest or road building. Additionally, increased trail development in an area containing significant cultural resources could result in indirect effects.

Field inventory of the Lab Bay area focused on proposed harvest units, around the log transfer facility (LTF), and along roads proposed in areas likely to contain cultural resources. No cultural resource sites were located within the 1,500 acres in or adjacent to units or road corridors; however, one site was located north of the proposed LTF while surveying 40 acres in the area. As inventory of the proposed harvest units, roads and the LTF neared completion, an additional 1,150 ± acres were surveyed in blocks or continuous strips along the shoreline in areas near proposed harvest activities. This resulted in relocation and evaluation of eight sites and the location and evaluation of nine previously unrecorded sites (Table 3-149). Table 3-149 includes information on the location of historic sites and Culturally Modified Trees, none of which are considered significant resources warranting avoidance or further data collection.

Alternative 1, the No Action Alternative, would result in no further effects on cultural or paleontological resources. Under Alternative 2, the full unit pool, there are risks of direct impacts to known paleontological resources associated with caves in high vulnerability karst areas. Indirect impacts to cultural resources could result from any action in units near the coast of Thorne Island. The Calder Tie Road, while proposed as part of Alternative 2, could be incorporated into

any of the action alternatives. Because it would be located in an area determined to have a low probability for cultural resources, it was not surveyed by cultural resources personnel.

Under Alternative 3 there would be no impacts to known paleontological resources; however, it could adversely effect one site (PET-209) recommended as eligible for listing on the National Register of Historic Places. It is located near the proposed Log Transfer Facility (LTF) on Thorne Island. Given the distance of PET-209 from the LTF and the current LTF standards and guidelines, there should not be any direct impact from development. PET-209 is located in an area that may prove useful as an anchor point for log booms to contain logs cut on Thorne Island or as a protected area for log storage, thus indirect impacts could occur.

Under Alternative 4 there are risks of direct impacts to known paleontological resources associated with caves in high vulnerability karst areas. Indirect impacts to known cultural resource sites from any action in units near the coast of Thorne Island should be minimized if the 2-acre patch cuts are logged by helicopter. The cultural resource survey undertaken on Thorne Island only included high probability areas for cultural resources adjacent to the large harvest units. Therefore, additional survey of high probability areas would be required prior to implementation of the 2-acre patch cuts primarily on the west and southwest sides of the island. Approximately 10 of the 2-acre patch cuts are located in unsurveyed high probability areas.

Under Alternative 5 there are risks of direct impacts to known paleontological resources associated with caves in high vulnerability karst areas and indirect impacts to cultural resources, particularly PET-209, from any action in units near the coast or at the proposed LTF on Thorne Island.

Implementation of Alternative 6 would not affect known paleontological resources since harvest in high vulnerability karst areas would be avoided. Potential direct and indirect effects to Thorne Island resources would be as described in Alternative 4, where the implementation of an uneven-aged management is proposed. Additional surveys of approximately 10 2-acre patch cuts located in areas identified as high probability for cultural resources would be required.

Cumulative Effects

Impacts from natural decay, landscape changes, private developments, and timber management activities collectively result in the loss of nonrenewable cultural resources in Southeast Alaska. Development activities of all kinds pose particular threats to cultural resources because such activities tend to be located in the same places that cultural resources are found, such as sheltered coastal settings.

It is impossible to determine the extent of resources that may previously have been disturbed in the Lab Bay Project Area. Intensive cultural resource investigations and mitigation measures have been implemented only since the 1980's. The implementation of updated research and survey designs based upon the results of previous work and current methods and techniques, combined with various mitigation measures, will preserve significant sites and provide data that will guide future research and management activities. In addition, current management approaches for Beach Fringe/Estuary and Stream/Lake Protection LUD's should also benefit cultural resources through decreased activity in high probability areas and reduced indirect effects such as sedimentation of resources.

Table 3-149
Cultural Resource Inventory of Lab Bay Project Area by VCU

VCU	Affected Alternative	Year(s) of Survey	Acres Intensively Surveyed	Acres Reconnaissance Surveyed	Cultural Resources Recorded
527	2,4,5	1992, 1994	275	50	PET-207 (includes PET-332, PET-333, & PET-334), PET-408, CMT-07, CMT-11
528	2,4	1992	50	45	PET-329
529	2,3,4	1992	300	280	Isolated whiteware ceramics
530	2,4,5	1992	485	105	PET-205
531	2	1991, 1992, 1994	170	200	PET-204, PET-210, PET-408
532	2,3,4,5	1992	395	250	PET-125, PET-201, PET-202, PET-203, PET-126/181, PET-127/187, CMT-06, CMT-08, CMT-09
532/533		1992	80	80	PET-128, CMT-01
533	2,3,5	1992		190	
534	2,3,4,5	1992	180	45	
536		1992	50		CMT-04
537		1992	50		PET-220, PET-221, PET-317, CMT-14
538		1992, 1993	50	105	PET-206, PET-222
539	2,4,5	1992	275	110	CMT-02
540	2,3,4,5	1992	55		
551	2,3,5	1992, 1993	240	85	PET-208, PET-209, PET-225, CMT-03, CMT-05, CMT-10, CMT-12, CMT-13
Totals			**2655**	**1545**	**4200**

Source: Greiser 1992

It is impossible to determine the extent of resources that may previously have been disturbed in the Lab Bay Project Area. Intensive cultural resource investigations and mitigation measures have been implemented only since the 1980's. The implementation of updated research and survey designs based upon the results of previous work and current methods and techniques, combine with various mitigation measures, will preserve significant sites and provide data that will guide future research and management activities. In addition, current management approaches for Beach Fringe/Estuary and Stream/Lake Protection LUD's should also benefit cultural resources through decreased activity in high probability areas and reduced indirect effects such as sedimentation of resources.

Mitigation

The preferred mitigation management approach of the Alaska Region of the Forest Service for cultural resource sites is avoidance. If the Thorne Island LTF is located where it is proposed, the nearby site may be subjected to indirect project impacts such as disturbance from harvest-related activities or unauthorized digging. To address these concerns, Forest Service personnel will monitor the area during construction and operation activities. If disturbance occurs or is imminent, then the Forest Service will implement the National Historic Preservation Act, Section 106 process. Indirect impacts to known cultural resource sites from any action in units near the coast of Thorne Island should be minimized if the 2-acre patch cuts are logged by helicopter. The cultural resource survey undertaken on Thorne Island only included high probability areas for cultural resources adjacent to the large harvest units. Therefore, additional survey of high probability areas would be required prior to implementation of approximately 10 the 2-acre patch cuts, located primarily on the west and southwest sides of the island.

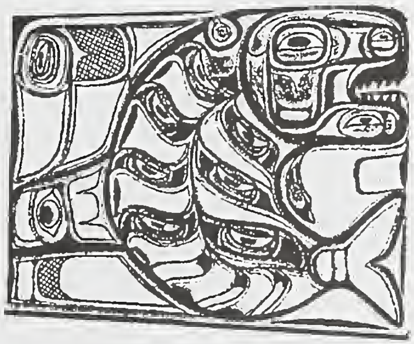
Monitoring

The Forest Plan recognizes three distinct types of monitoring: implementation, effectiveness, and validation. Implementation monitoring determines if projects and activities comply with Forest Plan standards and guidelines. Effectiveness monitoring determines whether the standards and guidelines achieve the desired results. Validation monitoring determines whether the assumptions in the Forest Plan regarding the relationship between management actions and their effects are correct, or if there is a better way to depict these relationships.

A monitoring plan has been developed for the Tongass National Forest by the Forest Planning Team and is described in the TLMP Draft Revision (1991a). Recommendations for monitoring cultural resources for the Lab Bay Project Area have been documented in the Cultural Resources Report (Greiser 1992) for the project planning record.

Where development is planned in areas likely to contain cultural resource sites or in the vicinity of known cultural resources, a plan for monitoring known significant resources and monitoring for previously unknown sites will be developed to mitigate those effects. If new sites are exposed, they would be recorded and evaluated for National Register eligibility.

Project-specific monitoring that is unique to the Lab Bay Project Area, and would not be included in regular Forest Plan or routine implementation monitoring, has been identified for several resources. Project-specific monitoring is not identified for cultural resources in the Lab Bay Project Area. Chapter 2 summarizes how project activities relate to Forest Plan and Ketchikan Area monitoring plans, and describes project-specific monitoring opportunities.



Wooden Drum with Killer Whale design, Tlingit tribe.

Visual Resources

Every landscape has its own character and patterns, its own scale and its own range of tone and colour. This character is based on the facts of geology and climate and developed through the history of land-use. It's only when this individuality is appreciated, that forestry can be developed into a good landscape attuned to its locality.

Sylvia Crowe
Forestry in the Landscape

Key Terms

Casual Forest Visitor - One who temporarily inhabits the Forest and typically engages in recreational pursuits. This visitor has a conscious or subconscious interest in scenic quality.

Cumulative Visual Disturbance (CVD) - The amount of disturbance visible to the casual forest visitor at any one point in time. As determined in planimetric view and applied by the Forest Service, CVD suggests the percentage of a viewshed to be in a disturbed condition at any one point in time.

Distance Zone - Areas of landscapes denoted by specified distances from the observer (Foreground: 0 to 1/4-1/2 mile, Middleground: 1/4-1/2 to 3-5 miles, or Background: greater than 3-5 miles). Used as a frame of reference in which to discuss landscape characteristics and management activities.

Existing Visual Condition (EVC) - The level of visual quality or condition presently occurring on the ground.

Future Visual Condition (FVC) - The level of visual quality or condition occurring on the ground at the end of the proposed harvest period.

Perspective View - The landscape as seen by an observer from a viewpoint; measurements are three-dimensional (height, width, and depth).

Planimetric View - The landscape as seen from above; measurements are two-dimensional (length and width).

Sensitivity Level - The measure of people's concern for scenic quality. Three levels are assigned, based on the Forest Service Visual Management System methodology (National Forest Landscape Management, Vol. 2, Ch. 1).

Variety Class - Distinguishes areas of high importance from those of lesser importance, based on scenic quality, as defined in the Forest Service Visual Management System.

Viewshed - The seen, or viewed, area from one or more viewpoints as defined by multiple viewframes; as seen from road, marine waterway, or specific viewpoint.

Visual Absorption Capability (VAC) - An estimate of the relative ability of a landscape to absorb management activities.

Visual Quality Objective (VQO) - A measurable standard reflecting five different degrees of acceptable landscape alteration.

Adopted VQO - The VQO to be achieved as a result of management direction identified in the approved Forest Plan. Adopted VQO's represent the visual resource objective for the Forest Land Management Plan period.

Preservation - Management activities are generally not allowed in this setting. The landscape is allowed to evolve naturally.

Retention - Management activities are not evident to the casual Forest visitor.

Partial Retention - Management activities may be evident, but are subordinate to the characteristic landscape.

Key Terms (continued)

Modification - Management activities may dominate the characteristic landscape but will, at the same time, use naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed as middleground (1/4 to 5 miles from viewer).

Maximum Modification - Management activities may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.

Affected Environment

An important aspect of Southeast Alaska's natural resource base is its attractive setting. The importance of the scenic splendor is reflected in the high levels of tourism and an awareness of scenic resource values by Alaska's residents. The Visual Management System, developed by the Forest Service (see Agricultural Handbook Number 462), inventories these scenic resources and provides measurable standards for their management.

The Visual Management System is a two part analytic process. The first part assesses the relative scenic quality (Visual Character Type and Variety Class) of the Project Area in its natural state. The second part assesses visual sensitivity levels based on the type and use of these landscapes.

Scenic quality, sensitivity levels and management goals are combined to establish Visual Quality Objectives (VQO's). These also are used to define the Existing Visual Condition (EVC), VQO and Visual Absorption Capability (VAC) settings. The Desired Future Condition (DFC) describes how the Forest should appear in the future given full implementation of the TLMP Draft Revision (1991a). The desired future condition for the Lab Bay Project Area emphasizes landscapes with a modified appearance to a greater degree than for the Tongass National Forest as a whole. Together with other resource-related goals, objectives, and management prescriptions, the Visual Management System criteria help govern the location, design, and scheduling of management activities such as timber harvest in an attempt to achieve the desired future conditions defined in the revised Forest Plan.

Visual Character Type

Visual character types describe large areas of land with common landform, rockform, and vegetation. The Lab Bay Project Area lies within the Kupreanof Lowland visual character type and is dominated by rolling terrain with elevations of 300 to 1,500 feet. This character type contains many islands and an intricate network of waterways. Mountains are scattered and block-like, rising to elevations approaching 3,500 feet. Shorelines contain many small bays, rock reefs, and occasional small gravel beaches. Several large and many small lakes punctuate the landscape, which is dominated by continuous tracts of mature spruce/hemlock forests. Alpine ecosystems are present at the highest elevations within this character type.

The visual condition of the Tongass varies by location and is dependent on a variety of natural and human-caused factors. Geology, vegetation, water, and other natural elements affect the visual condition, as do human-caused roads, rock quarries, timber harvests, log transfer facilities, recreation facilities, mining operations and other developments. The northern portion of Prince of Wales Island, including much of the Lab Bay Project Area, has been heavily altered by timber harvest and road development over the last few decades.

Scenic Quality

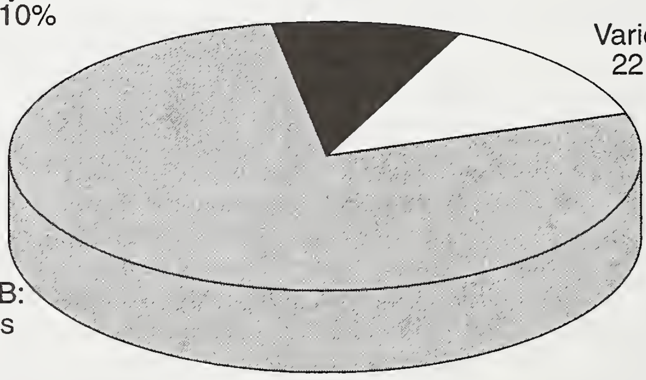
Having defined the Project Area's character type, the next step is to assess the relative scenic quality of all landscapes (as they exist in their natural state) in the analysis area. Scenic quality is a subjective evaluation, but the Visual Management System contains a system for evaluating and quantifying scenery. Landscapes are rated as follows:

The terrain in the Project Area is typical of the Kupreanof Lowland Visual Character Type.

Scenic Quality	Rating
Distinctive	Variety Class A
Common	Variety Class B
Minimal	Variety Class C

These ratings are based on the diversity of natural landform, rockform, waterform, and vegetation. All ratings are made relative to the overall character of the larger Kupreanof Lowland Visual Character Type (Fig 3-45).

Figure 3-45
Variety Classes in the Project Area



Source: Ketchikan Area GIS

Common landscapes (Variety Class B) dominate the Project Area. Distinctive landscapes (Variety Class A) comprise about 13 percent of the Project Area and are located around Perue Peak, Salmon Bay, Red Lake, and in the Mt. Calder/Holbrook LUD II area. Minimal variety (Variety Class C) comprises the smallest portion of the Lab Bay Project Area and is located in the Salmon Bay LUD II area and on Thorne Island.

Visual Sensitivity

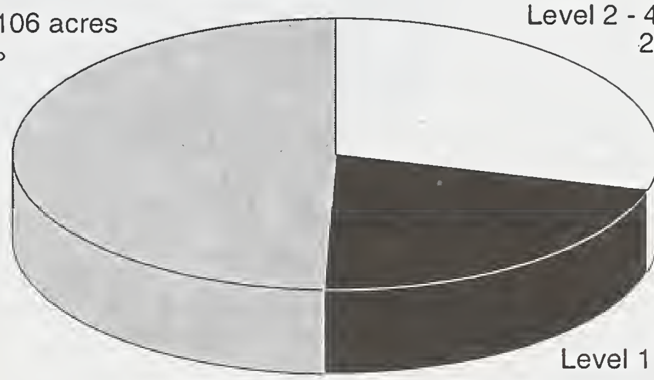
The Visual Management System also measures the concern of forest visitors for scenic quality, as seen from recreation use areas, communities, travel routes (marine and land), anchorages and cabins. These visually sensitive areas are based on their type and frequency of use, and are categorized as Highest Sensitivity (Level I), Average Sensitivity (Level II), and Lowest Sensitivity (Level III).

Highest Sensitivity (Level I) is assigned to viewsheds associated with heavily used recreation areas, marine travel routes, and communities. For the Lab Bay Project Area, this includes the ferry and cruiseship routes in Sumner Strait, Exchange Cove Campground, Red Lake cabin; and Salmon Bay Lake cabin. The communities of Port Protection, Point Baker, and Whale Passage are also classified as Highest Sensitivity. Areas of Highest Sensitivity comprise about 21 percent of the Project Area (see Figure 3-46).

Average Sensitivity (Level II) is assigned to moderately used recreation areas, boat routes, anchorages, and roads. For the Project Area this includes the West Coast Waterway, Red Bay, the mainline road system, and the Community of Labouchere Bay. Average Sensitivity makes up about 29 percent of the Lab Bay Project Area.

Lowest Sensitivity (Level III) is assigned to areas not seen from the previously mentioned travel routes or use areas, and comprises 49 percent of the Project Area.

Figure 3-46
Sensitivity Levels in the Project Area



Source: Ketchikan Area GIS

Inventory Visual Quality Objectives

Inventory VQO's are a set of measurable goals for the management of forest visual resources. VQO's are based on sensitivity levels, distance zones, and variety classes and describe different degrees of acceptable alteration to the natural landscape. VQO's are Preservation, Retention, Partial Retention, Modification, and Maximum Modification (see Key Terms).

Much of the interior of the Lab Bay Project Area has an Inventory VQO of Modification and Maximum Modification. Many areas seen from Highest and Average Sensitivity level travel routes and use areas have been given Inventory VQO's of Retention and Partial Retention. No Inventory VQO of Preservation areas occur in the Project Area.

Adopted Visual Quality Objectives

Inventory VQO's provided a starting point in the visual analysis of the Project alternatives. They were adjusted to reflect more specific management direction. These Adopted VQO's are summarized in Table 3-150 and represent the baseline from which visual.impacts were assessed.

Adopted Modification and Maximum Modification VQO's encompass about 58 percent of the Project Area, much of which is unseen by casual forest visitors. Areas designated for Partial Retention occur around Calder Bay, Dry Passage, coastal sections of Thorne Island, and Red Bay. Partial Retention areas also occur in middleground areas visible from Red Bay Lake and Salmon Bay Lake. LUD II and Special Interest areas, as well as foreground areas visible from Port Protection, Red Lake and Salmon Bay Lake, contain Retention VQO's. No areas within the Lab Bay Project contain the Adopted Preservation VQO.

Table 3-150
Adopted VQO's in the Project Area

		Distance Zone			
LUD(s)	**Visual Management Focus**	**Foreground**	**Middleground**	**Background**	**Not Seen**
Wild River, LUD II, Special Interest	Unmodified - Emphasize natural values and allow natural processes to determine future conditions.	Retention	Retention	Retention	Retention
Scenic River	Near Natural - Allow range of human activities in an environment where natural values predominate.	Retention	Partial Retention	Partial Retention	Modification
Beach Fringe and Estuary	Near Natural - Allow range of human activities in an environment where natural values predominate.	Partial Retention	Partial Retention	Partial Retention	Partial Retention
Scenic Viewshed	Modified - Allow minimal to moderate amount of timber harvest that is either not visually evident to most Forest visitors or is designed to appear compatible with surrounding landscapes.	Retention	Partial Retention	Partial Retention	Maximum Modification
Modified Landscape	Modified - Allow moderate amount of timber harvest that is either not visually evident in the foreground to most Forest visitors or is designed to appear compatible with surrounding landscapes.	Partial Retention	Modification	Modification	Maximum Modification
Timber Production	Highly Modified - Resource utilization is emphasized.	Modification	Maximum Modification	Maximum Modification	Maximum Modification

Source: TLMP Draft Revision (1991a)

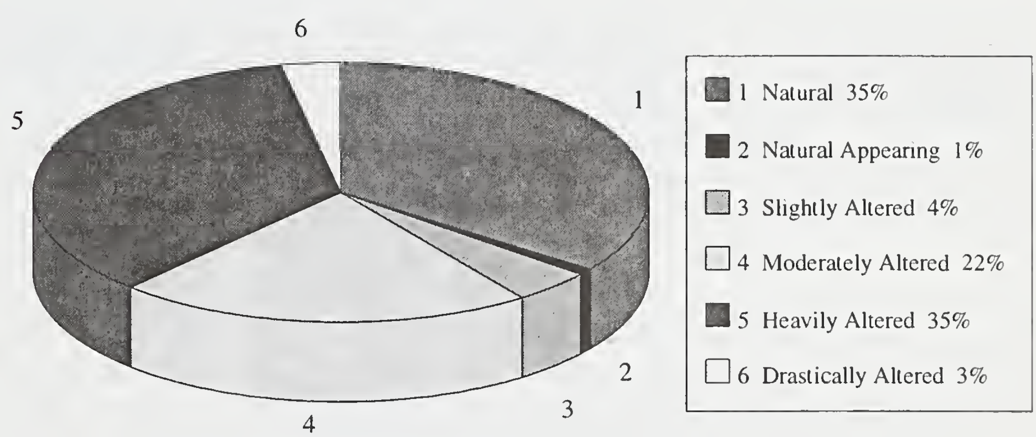
Existing and Future Visual Conditions

Existing Visual Condition (EVC) is a measurement of visual quality and visual effects of current management activities. EVC types range from Natural (Type 1), where only ecological changes have occurred, to Drastically Altered (Type 6), where human-caused changes are in "glaring contrast" to the landscape's natural appearance.

Large tracts that appear free of human activities (EVC Type 1) are present in the Mt. Calder and Salmon Bay Roadless Areas. Natural (Type 1) areas also occur in or around Port Protection, Calder Bay, Red Lake, Salmon Bay Lake, Marble Creek, Red Bay Mountain, Perue Peak, and on interior portions of the Thorne Island. Large areas that have been drastically altered (EVC Type 6) can be found along Road 20 throughout the Project Area and adjacent to Red Bay, and along the north shore of Exchange Cove.

The Future Visual Condition represents the visual condition that would be found at the end of the proposed harvest period. Like EVC, it is measured in terms of six condition types. When compared to EVC, Future Visual Condition serves: 1) to analyze the current management situation, 2) to estimate the effect of alternatives, 3) to facilitate visual monitoring, and 4) as a historical record of the degree and amount of physical alteration of the landscape over time and space. The Future Visual Condition created by each proposed alternative will be analyzed in the Effects of the Alternatives section.

Figure 3-47
EVC Types in the Project Area (in percent)



Source: Ketchikan Area GIS

Visual Absorption Capability

Visual Absorption Capability (VAC) is defined as the ability of the landscape to absorb management activities, such as timber harvest, without significantly affecting the visual character of the area. In other words, VAC helps determine how easy (or difficult) it will be to achieve the Adopted VQO. The landscape slope, variety class, and distance zone are analyzed. When overlayed, areas of High, Intermediate, and Low VAC are identified.

Steep slopes, lack of visual variety, and proximity to areas of high visual sensitivity make several areas of the Project's landscape unable to easily absorb management activities (they exhibit Low VAC). These areas include Calder Bay, Red Bay, Salmon Bay, Port Protection, Labouchere Bay, and coastal sections of Thorne Island. Much of the Project Area's interior exhibits High VAC.

Cumulative Visual Disturbance

Adopted VQO's and VAC levels are combined to establish guidelines for timber harvest planning and implementation. Cumulative Visual Disturbance (CVD), which suggests the maximum percentage of a viewshed (or portion thereof) to be in a disturbed condition at any one point in time, has been addressed as part of this effort (see Table 3-151).

Table 3-151
Cumulative Visual Disturbance (CVD) Guidelines

Adopted VQO/VAC	Maximum CVD
Retention/Low and Partial Retention/Low	8%
Retention/Intermediate and Retention/High	10%
Partial Retention/Intermediate and Modification/Low	15%
Partial Retention/High and Modification/Intermediate	20%
Modification/High	25%
Maximum Modification/Low or Intermediate or High	50%

Source: TLMP Draft Revision (1991a)

Priority Travel Routes and Use Areas

To assess the potential effects of harvest alternatives, a set of travel routes and use areas considered important to the Lab Bay Project Area has been identified. These priority travel routes and use areas are:

- Alaska Marine Highway and Cruiseship Route
- Port Protection
- Labouchere Bay
- Beach areas in the northwest corner of the Project Area
- Red Bay
- Red Lake
- Salmon Bay Lake and Stream
- Salmon Bay
- Exchange Cove
- Whale Passage
- West Coast Waterway

For each of these priority travel routes and use areas, scenic quality, distance zone, EVC, and an assessment of whether the present condition now meets the Adopted VQO's is described. Priority Travel Route and Use Area viewsheds (see Key Terms) are graphically depicted (Figure 3-48) in the Environmental Effects discussion of this section for those areas that would be visually altered by Project alternatives.

Alaska Marine Highway and Cruiseship Route

The Alaska Marine Highway stretches almost 1,000 nautical miles from Washington State to Skagway, providing a vital ferry link for people and their vehicles. A portion of the marine highway borders the eastern side of the Lab Bay Project Area. The ferry uses Clarence Strait, veering east around Zarembo Island, and docks at Wrangell or Petersburg. Common Scenic

Quality (Variety Class B) dominates the portion of the Project Area visible from the Marine Highway, most of which has an adopted VQO of Maximum Modification. EVC ranges from Natural (EVC 1) to Heavily Altered (EVC 5). Ferry travelers see the Lab Bay Project Area from a distance of approximately 8 miles. Visual contrast between harvest activity and the natural landscape is minimal at this distance, due to intervening islands and atmospheric attenuation.

From May through September, more than 20 luxury-liners travel the Inside Passage. Cruiseship routes follow the Alaska Marine Highway through Clarence Strait to the northeast corner of Zarembo Island, where they veer westward into Snow Pass and Sumner Strait. Common (Variety Class B) and Minimal (Variety Class C) Scenic Quality exists in the area seen from the cruiseship route along the north and northeast coast of Prince of Wales Island. EVC ranges from Natural (EVC 1) in the designated Salmon Bay Roadless Area to Drastically Altered (EVC 6) in areas of Red Bay seen from the Cruiseship Route. Off the northeast coast of Prince of Wales Island, cruiseships typically travel about 5 miles (background distance zone) from the shore. From here they angle westward and towards the Project Area, coming within 2 miles (middleground) off shore of Point Baker. Passengers are afforded unobstructed views throughout Sumner Strait. Several areas of Heavy (EVC 5) and Drastic (EVC 6) alteration visible around Red Bay and on slopes west of Red Bay have adopted VQO's of Partial Retention and Modification. In clear weather the Project Area appears as a series of irregular and overlapping ridgelines.

Port Protection

Throughout this saltwater bay, anchorages provide boaters with foreground and middleground views of the Project Area. The communities of Point Baker, Port Protection, and Wooden Wheel Cove are located along the shoreline on private land, providing homes to over 100 people.

Project Area landscapes surrounding Port Protection have been placed in the Scenic Viewshed LUD. Scenic Quality is Common (Variety Class B), consisting of heavily wooded slopes that rise from the water's edge. Knobs visible in the foreground are coarsely textured by individual tree boughs. The gray-green of this vegetation contrasts with the dark blues of the water. Peaks and ridges seen in the middleground are finely textured. EVC ranges from Natural (Type 1) on Protection Head and in the southwest to Heavily Altered (Type 5) east of Port Protection. All management activities currently comply with their Retention, Partial Retention, and Maximum Modification (in unseen areas) VQO's.

Labouchere Bay

The formerly active logging camp, log transfer facility and associated saltwater offer foreground and middleground views of the Project Area. Scenic Quality is Common (Variety Class B) with EVC ranging from Slightly Altered (Type 3) in areas along the north shore to Moderately Altered (Type 4) along the east and south shore. A Heavily Altered (EVC 5) slope is visible from the former camp site along the south shore of Labouchere Bay. Here, the bright green of the second growth contrasts sharply with the gray-green of the surrounding vegetation. Most of the viewshed has a VQO of Modification; however, the Heavily Altered slope along the south shore has a Maximum Modification VQO. Past management activities are in compliance with these VQO's.

Beach Areas in the Northwest Corner of the Project Area

An anchorage at Merrifield Bay and several easily accessible use areas are located along Sumner Strait. Memorial Beach picnic site, near the mouth of Flicker Creek, is easily reached by small boat and by foot via a short hiking trail. Background views from the beach are oriented north across Sumner Strait to Kupreanof Island.

Scenic Quality is Common (Variety Class B) and the EVC Natural Appearing (EVC 2). Past management activities comply with the Partial Retention and Modification VQO's.

Red Bay

This area borders Sumner Strait and serves as the outlet for Red Lake. It is a popular fishing, hunting, anchorage, and recreation area for residents of nearby communities. From Red Bay, the Project Area is visible in the foreground, middleground, and background.

Common (Variety Class B) Scenic Quality is found throughout the Red Bay viewshed. The head of the Bay is not heavily modified in the foreground. EVC ranges from Natural (EVC 1) in a narrow strip along the western shore to Drastically Altered (EVC 6) in an area east of the Bay. Here, a prominent hillside has recently been harvested. Within this bright green and finely-textured landscape lies a focal area of dark green and coarsely-textured timber in the shape of the letter "T". Adopted VQO's of Partial Retention, Modification, and Maximum Modification occur within the viewshed. Existing conditions in some portions of the visible Project Area do not currently comply with these adopted VQO's. Several areas of Heavy (EVC 5) and Drastic (EVC 6) alteration have adopted VQO's of Partial Retention and Modification. A large blowdown harvest on the east side of the Bay and a large area of recent harvest west of the Bay do not comply with their adopted Modification VQO.

Red Lake

This area of high recreational value is located immediately south of Red Bay, to which it is linked by a creek and hiking trail. From a trailhead on Road 20, the trail follows Red Creek through a dense stand of timber and terminates at the north shore of the lake. No views of the surrounding landscape are found along the trail. The cabin was recently relocated to the south-east shore of the lake. It is easily accessed by a skiff that resides at the terminus of the trail. Views from the cabin are oriented south and no past management activity is visible.

Scenic Quality for much of the Red Lake viewshed is Common (Variety Class B); however, the steep slopes, alpine vegetation, and rock outcrops at the south end of the lake give this area a Distinctive rating (Variety Class A). Foreground views have a Retention VQO, as they are within a Scenic Viewshed LUD. The entire perimeter of the lake is Natural (EVC 1). Middle-ground slopes visible west and north of the lake have an Adopted VQO of Maximum Modification because they are within a Timber Production LUD. Existing visual condition on these middleground slopes ranges from Slight Altered (EVC 3) to Moderately Altered (EVC 4).

Salmon Bay Lake and Stream

This free-flowing river system offers regionally significant recreation opportunities. A hiking trail begins at tidewater and terminates in the vicinity of an existing Forest Service cabin. The cabin is located at the north end of the Salmon Bay Lake, with views oriented due south to the steep and uniformly forested middleground slopes at the opposite end of the lake. Paralleling the Salmon Bay River, in an area of National Scenic River eligibility, the trail traverses old-growth timber and an extensive grass flat.

Common Scenic Quality (Variety Class B) occurs in areas visible from Salmon Bay Lake and Stream. EVC ranges from Natural (Type 1) in the foreground adjacent to the lake to Heavily Altered (Type 5) on middleground slopes east of the lake. Scenic River, Wild River, LUD II, and Scenic Viewshed LUD's surround the lake and stream. The Adopted Retention VQO dominates the seen area, although slopes east of the lake are Partial Retention. Existing levels of visual disturbance are consistent with Adopted VQO's, except for these middleground slopes east of the lake. Here, Heavily Altered (EVC 5) areas occur within a VQO where management activities are to be subordinate to the natural landscape (Partial Retention).

Salmon Bay

Due to its strategic location at the intersection of Sumner Strait and Clarence Strait, anchorages in the area are heavily used. Numerous islands and inlets, continuously forested slopes, and relatively low topographic relief, give the area Common Scenic Quality (Variety Class B). No human-caused changes have taken place along the shoreline, giving the foreground a Natural appearance (EVC 1) and allowing the adopted Retention VQO to be achieved. Recent harvest activity is visible from the mouth of the northern entry. This Moderately Altered (EVC 4) portion of the middleground has an adopted VQO of Modification. Although the color and texture of this harvest contrast sharply with the natural landscape, its edges are obscured by intervening topography and vegetation. As a result, this activity resembles a natural pattern.

Exchange Cove

Only a short drive from the community of Whale Pass, Exchange Cove is a local recreation destination. The State maintains a campground along the beach in the northwest portion of the Cove. The campground, from which views are oriented east, is popular with fishermen.

Common Scenic Quality (Variety Class B) is found throughout the Exchange Cove viewshed. EVC ranges from Natural (Type 1) along the east shore to Drastically Altered (Type 6) along the northwest shore, where large rectilinear units are in glaring contrast to the landscapes natural appearance. With the exception of the Drastically Altered area, existing disturbance adheres to the adopted Partial Retention, Modification, and Maximum Modification VQO's.

Whale Passage

This saltwater use area is bounded by the community of Whale Pass on the west and Thorne Island on the east. A modern fishing resort (Whales Resort), anchorages, an existing log transfer facility, and a community of about 100 are associated with this area. Foreground and middleground views of the Project Area are available.

Scenic Quality is Common (Variety Class B) on the mainland portion of the viewshed and Minimal (Variety Class C) on Thorne Island, where low, rounded, and uniformly wooded knobs make up the seen area. Thorne Island and much of the seen area along the mainland are in the Modified Landscape LUD. The remainder of the viewshed is in the Timber Production LUD. The landscape appears Natural (EVC 1) to Moderately Altered (EVC 4), and adheres to the adopted Partial Retention, Modification and Maximum Modification VQO's.

West Coast Waterway

Encompassing Dry Pass, Calder Bay, and El Capitan Passage, the West Coast Waterway provides a travel route with numerous anchorages. The West Coast Waterway is a popular fishing, hunting, and general recreation area for residents of Whale Passage, Point Baker, and Port Protection. Calder Bay receives the bulk of this use. The Project Area is a foreground and/or middleground landscape element to users of the waterway. Perhaps the most visible portion of the West Coast Waterway is the “corner” of El Capitan Passage. This area is a focal element to viewers traveling north and east within the Passage.

Steep forested slopes rise from Calder Bay and are punctuated by large rock outcrops. This combination of water, land, and rock formations gives Calder Bay Distinctive Scenic Quality (Variety Class A). The remainder of the West Coast Waterway contains Common Scenic Quality (Variety Class B). EVC ranges from Natural (EVC 1) immediately surrounding Calder Bay to Drastically Altered (EVC 6) in areas lining El Capitan Passage. Middleground slopes at the head of Calder Bay are Heavily Altered (EVC 5), as are the steep slopes between Calder Bay and the entrance to Dry Pass. Adopted VQO's include Retention associated with the El Capitan Special Interest Area, Partial Retention around Calder Bay and portions of Dry Passage, and Modification along El Capitan Passage. Areas of Maximum Modification also exist throughout the viewshed. Existing conditions (EVC 5) in the middleground to the north of Calder Bay do not meet the adopted Modification VQO, nor do the Heavily Altered (EVC 5) slopes between Calder Bay and the entrance to Dry Pass meet the adopted Partial Retention VQO. Likewise, other small portions of the landscape seen from Dry Pass are Drastically Altered (EVC 6) and do not comply with the adopted Partial Retention and Modification VQO's.

Effects of the Alternatives

The following discussion evaluates the visual effects of proposed alternatives on Priority Travel Routes and Use Areas. Viewsheds are graphically depicted in Figure 3-48 for those areas that would be visually altered by Project alternatives. Perspective plots of harvest units within selected viewsheds are presented in Appendix M. Perspective plots portray the current visual condition and the anticipated effects of key harvest units on Priority Travel Routes and Use Areas. The discussion that follows focuses on the ability of the proposed harvest activity to meet adopted VQO's and the resulting Future Visual Condition (FVC). It should be noted that all

Figure 3-48
Priority Travel Route and Use Area Affected by Project Alternatives

proposed harvest activity is expected to meet the adopted VQO's. It is followed by an assessment of potential Cumulative Visual Disturbance.

Because no alternatives propose substantial timber harvest activity within their viewsheds, there would be no measurable adverse visual effect upon the following Travel Routes and Use Areas:

- Labouchere Bay
- Beach Areas in the northwest corner of the Project Area
- Salmon Bay Lake

One or more harvest alternatives contain units that would visually affect the following viewsheds:

- Alaska Marine Highway and Cruiseship Route
- Port Protection
- Red Bay
- Red Lake
- Salmon Bay
- Exchange Cove
- Whale Passage
- West Coast Waterway

The affect of each alternative on these viewsheds is described below.

Effects of the Alternatives by Viewshed

Alaska Marine Highway and Cruiseship Route

Implementing any of the Project alternatives would have little visual effect on the Alaskan Marine Highway. Visual contrast between proposed harvest activity and the natural landscape would be minimal at this distance (approximately 8 miles), due to intervening islands and atmospheric attenuation. However, several units would be apparent from the Cruiseship Route in each of the action alternatives. VQO's in this portion of the Project Area are Partial Retention, Modification and Maximum Modification.

Alternative 1

No units are proposed to be harvested under Alternative 1. EVC, which presently ranges from Natural (EVC 1) to Heavily Altered (EVC 5), would remain unchanged except for continuing changes in tree height, color and texture.

Alternative 2

Twenty-three units are expected to be seen from the Cruiseship Route (see Table 3-152) in the middleground and background distance zones. Units 527-206, -227, and -228 would appear as middleground elements in the vicinity of Port Protection. A small portion of 527-206 would be visible from the Cruiseship Route. As seen from this viewpoint, the unit would meet the adopted Partial Retention VQO and the visual condition would remain Heavily Altered (FVC 5). Units 527-227 and -228 would be visible on Protection Head. Use of group selection harvest and helicopter logging techniques would allow these units to meet the adopted Partial Retention VQO, while changing the area from Natural (EVC 1) to Slightly Altered (FVC 3).

Units 529-282 and 530-226 would be apparent on middleground slopes located between Port Protection and Red Bay. Unit 529-282 is relatively small (28 acres). It would meet the adopted Modification VQO, while the Moderately Altered visual condition would remain unchanged (FVC 4). Individual tree selection along the west edge of 530-226 helps this unit meet the adopted Modification VQO. The Heavily Altered visual condition in the vicinity of Unit 530-226 would become Drastically Altered (FVC 6). Units 530-228 and -230 would be seen as background elements between Port Protection and Red Bay. Unit 530-228 would meet its adopted

Modification VQO, while -230 would meet Maximum Modification. Harvest of 530-228 and -230 would convert Heavily Altered (EVC 5) areas into those that are Drastically Altered (FVC 6).

Fourteen units would be visible from the Cruiseship Route in the area of Red Bay. Portions of 532-220, -221, -223, and -231 would be visible east of the bay in the middleground. Harvesting these units would comply with the adopted Modification VQO, while changing the visual condition from Natural (EVC 1) to Moderately Altered (FVC 4). Units 533-201, -205, and -245 would be visible southwest of the Red Bay in the middleground. Unit 533-201 was designed to contain a leave-tree area along its upper edge, while Unit 533-245 is to be a group selection harvest. Each of these units would meet the adopted Maximum Modification VQO. The associated visual condition would be converted from Moderately Altered (EVC 4) to Heavily Altered (FVC 5). Units 533-251, -252, -254, -255, -256, -257, and -258 would be visible in the middleground south of Red Bay. Unit 533-251 would meet the adopted Maximum Modification VQO, while changing the visual condition from Natural (EVC 1) to Heavily Altered (FVC 5). Units 533-252 through -258 would be patchcut and helicopter logged. This would allow Unit 533-252 to easily meet the adopted Maximum Modification VQO. It would also allow the remaining units to meet the adopted Partial Retention VQO. The visual condition associated with the patch cuts would change from Natural (EVC 1) to Slightly Altered (FVC 3).

Units 534.1-211 and -212 would be seen south of California Bay in the background distance zone. These units would achieve the adopted Modification VQO, while converting a Natural Area (EVC 1) to one that is Moderately Altered (FVC 4).

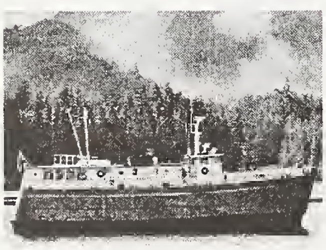
Alternative 3

Eleven units are expected to be seen in the middleground and background from the Cruiseship Route. Unit 529-282 would be visible on a middleground slope located between Port Protection and Red Bay. It is relatively small (28 acres) and would meet the adopted Modification VQO. The Moderately Altered visual condition would remain unchanged (FVC 4).

Eight units would be seen in the area of Red Bay. Portions of 532-220, -221, -223, and -231 would be apparent east of the bay in the middleground, where they would meet the adopted Modification VQO. As a result of harvesting these units, the visual condition would change from Natural (EVC 1) to Moderately Altered (FVC 4). Units 533-201, -205, and -245 would be seen as middleground elements southwest of Red Bay. Unit 533-201 would contain a leave-tree area along its upper edge, while Unit 533-245 would be a group selection harvest. Each of these units would meet the adopted Modification VQO, while changing an area of Moderate Alteration (EVC 4) to one of Heavy Alteration (FVC 5). Lastly, Unit 533-251 would be visible to the south of Red Bay. It would meet the adopted Maximum Modification VQO and change the visual condition from Natural (EVC 1) to Heavily Altered (FVC 5).

Units 534.1-211 and -212 would be seen south of California Bay in the background distance zone. These units would achieve the adopted Modification VQO, while converting a Natural Area (EVC 1) to one that is Moderately Altered (FVC 4).

Alternative 4



Fourteen units would be visible from the Cruiseship Route, two of which are located on Protection Head. Here, logging would allow Units 527-227 and 527-228 to meet the adopted Partial Retention VQO, as seen in the middleground. The visual condition would change from Natural (EVC 1) to Slightly Altered (FVC 3).

Units 529-282, 530-226, -228, and -230 would be visible in the middleground between Port Protection and Red Bay. Unit 529-282 is relatively small (28 acres) and would met the adopted Modification VQO. The associated visual condition would remain Moderately Altered (FVC 4). Unit 530-226 would meet the adopted Modification VQO, in part because of an individual tree selection along the western boundary. The Heavily Altered visual condition in the vicinity of Unit 530-226 would become drastically altered (FVC 6). Units 530-228 and -230 would be seen as background elements between Port Protection and Red Bay. Unit 530-228 would meet its

adopted Modification VQO, while -230 would meet Maximum Modification. Harvest of 530-228 and -230 would convert Heavily Altered (EVC 5) areas into those that are Drastically Altered (FVC 6).

Six units would be harvested in the middleground around Red Bay. Portions of 532-220, -221, -223, and -231 would be visible east of the bay, where they would meet the adopted Modification VQO and change the visual condition from Natural (EVC 1) to Moderately Altered (FVC 4). Unit 533-205 would be apparent southwest of Red Bay. It would meet the adopted Maximum Modification VQO and convert a Moderately Altered (EVC 4) area into one that is Heavily Altered (FVC 5). Unit 533-252 would also be apparent south of Red Bay. Patch cutting and helicopter logging would allow this harvest to easily achieve the adopted Maximum Modification VQO. The associated visual condition would change from Natural (EVC 1) to Slightly Altered (FVC 3).

Units 534.1-211 and -212 would be seen south of California Bay in the background distance zone. These units would achieve the adopted Modification VQO, while converting a Natural Area (EVC 1) to one that is Moderately Altered (FVC 4).

Alternative 5

This alternative proposes to harvest 22 units that would be visible from the Cruiseship Route, the visual effects of which are nearly identical to those of Alternative 2 (described above). However, Alternative 5 does not propose to harvest Unit 529-282, which would be visible between Port Protection and Red Bay.

Alternative 6

Five units would be visible in the middleground from the Cruiseship Route. Unit 529-282, which is relatively small (28 acres), would be apparent between Port Protection and Red Bay. It would meet the adopted Modification VQO and leave the Moderately Altered visual condition unchanged (FVC 4).

The remaining visible units are located near Red Bay. Unit 532-220 would be seen east of the bay. It would meet the adopted Modification VQO, while changing the visual condition from Natural (EVC 1) to Moderately Altered (FVC 4). Units 533-205 and -245 would be seen southwest of the bay. They would meet the adopted Modification VQO, while changing the visual condition from Moderately (EVC 4) to Heavily Altered (FVC 5). Lastly, 532-251 would be seen south of Red Bay. It would meet the adopted Maximum Modification VQO, while changing the visual condition from Natural (EVC 1) to Heavily Altered (FVC 5).

Table 3-152

Summary of Proposed Harvest Units Visible within the Cruiseship Route Viewshed

VCU	Unit	Alternatives 2	3	4	5	6	LUD[1]	Distance Zone[2]	Adopted VQO[3]	EVC	FVC	Notes
527	206	+			+		SV	MG	PR	5	5	
527	227	+		+	+		SV	MG	PR	1	3	Group Selection; Helicopter
527	228	+		+	+		SV	MG	PR	1	3	Group Selection; Helicopter
529	282	+	+	+		+	ML	MG	M	4	4	28 Acres
530	226	+		+	+		ML	MG	M	5	6	ITM West Portion
530	228	+		+	+		ML	MG	M	5	6	
530	230	+		+	+		TP	MG	MM	5	6	
532	220	+	+	+	+	+	ML	MG	M	1	4	
532	221	+	+	+	+		ML	MG	M	1	4	

Table 3-152 (Continued)

Summary of Proposed Harvest Units Visible within the Cruiseship Route Viewshed

VCU	Unit	Alternatives 2	3	4	5	6	LUD[1]	Distance Zone[2]	Adopted VQO[3]	EVC	FVC	Notes
532	223	+	+	+	+		ML	MG	M	1	4	
532	231	+	+	+	+		ML	MG	M	1	4	Seed Tree Throughout
533	201	+	+		+		TP	MG	MM	4	5	Leave Tree Area on Upper Edge
533	205	+	+	+	+	+	TP	MG	MM	4	5	
533	245	+	+		+	+	TP	MG	MM	4	5	Group Select Setting
533	251	+	+		+	+	TP	MG	MM	1	5	
533	252	+		+	+		TP	MG	MM	1	3	Helicopter, Patch Cuts
533	254	+			+		SV	MG	PR	1	3	Helicopter, Patch Cuts
533	255	+			+		SV	MG	PR	1	3	Helicopter, Patch Cuts
533	256	+			+		SV	MG	PR	1	3	Helicopter, Patch Cuts
533	257	+			+		SV	MG	PR	1	3	Helicopter, Patch Cuts
533	258	+			+		SV	MG	PR	1	3	Helicopter, Patch Cuts
534.1	211	+	+	+	+		ML	BG	M	1	4	
534.1	212	+	+	+	+		ML	BG	M	1	4	
No. Units Visible		23	11	14	22	5						

Source: Suttle 1993

[1] TP = Timber Production; SV = Scenic Viewshed; ML = Modified Landscape.

[2] FG = Foreground; MG - Middleground; BG = Background.

[3] R = Retention; PR = Partial Retention; M = Modification; MM = Maximum Modification

Port Protection

Project Area landscapes surrounding Port Protection have been placed in the Scenic Viewshed LUD. Adopted VQO's are Retention in the foreground, Partial Retention in the middleground and background, and Maximum Modification in areas unseen from this saltwater bay. Several of the action alternatives would visually alter this viewshed (Table 3-153).

Alternatives 1, 3, and 6

No new harvest activity is proposed. The visual condition within the viewshed, which ranges from Natural (EVC 1) to Heavily Altered (EVC 5), would remain unchanged, except for the continuing change in tree height, color, and texture.

Alternatives 2, 4, and 5

Two proposed units (527-227 and -228) would be visible on Protection Head in the middle-ground. Both units would employ group selection harvest and helicopter logging to achieve the adopted Partial Retention VQO. In so doing, the Natural (EVC 1) visual condition would be changed to Slightly Altered (FVC 3).

Table 3-153
Summary of Proposed Harvest Units Visible within the Port Protection Viewshed

VCU	Unit	Alternatives 2	3	4	5	6	LUD[1]	Distance Zone[2]	Adopted VQO[3]	EVC	FVC	Notes
527	227	+		+	+		SV	MG	PR	1	3	Group Selection; Helicopter
527	228	+		+	+		SV	MG	PR	1	3	Group Selection; Helicopter
No. Units Visible		2	0	2	2	0						

Source: Suttle 1993

[1] TP = Timber Production; SV = Scenic Viewshed; ML = Modified Landscape.

[2] FG = Foreground; MG - Middleground; BG = Background.

[3] R = Retention; PR = Partial Retention; M = Modification; MM = Maximum Modification

Red Bay

The adopted VQO's for this popular recreation area include Partial Retention in the foreground. The Partial Retention VQO has also been adopted for a portion of the Red Bay viewshed that is visible from Red Lake. The Modification and Maximum Modification VQO's make up the remainder of the viewshed. All action alternatives would have visual effects in the middleground distance within the Red Bay viewshed (Table 3-154).

Alternative 1

No harvest activity is proposed by this "no action" alternative. The visual condition, which ranges from Natural (EVC 1) to Drastically Altered (EVC 6), would be unaltered with the exception of continuing change in tree height, color, and texture.

Alternatives 2 and 5

These alternatives propose to harvest 12 units that would be visible in the middleground from Red Bay. Unit 532-228 would be apparent to those looking northwest from the southeast portion of the Bay. An estuary buffer would screen the lower portion of this unit, allowing it to achieve the adopted Modification VQO, while changing the visual condition from Natural (EVC 1) to Moderately Altered (EVC 4). Unit 532-231 would be visible east of the bay. A seed-tree cut would help this unit meet the adopted Modification VQO, while changing the visual condition from Natural (EVC 1) to Moderately Altered (FVC 4).

Units 533-201, -205, and -245 would be visible southwest of Red Bay. A leave-tree area along the upper edge of Unit 533-201 would help mitigate its visual impact, as would be the use of a group selection cut in Unit 533-245. All three units would comply with the adopted Maximum Modification VQO and change the visual condition from Moderately Altered (EVC 4) to Heavily Altered (FVC 5). Unit 533-251 would be visible south of Red Bay, where it would meet the adopted Maximum Modification VQO and change the visual condition from Natural (EVC 1) to Heavily Altered (FVC 5). The remaining units would be patch cut and helicopter logged south of the bay. This would allow units 533-254, -255, -256, -257, and -258 to meet the adopted Partial Retention VQO. The visual condition of these patch cuts would change from Natural (EVC 1) to Slightly Altered (FVC 3).

Alternative 3

Five visible units are proposed for harvest. Unit 532-231 would be seen east of Red Bay. The adopted Modification VQO would be achieved, in part through the use of a seed tree cut. The visual condition associated with Unit 532-231 would change from Natural (EVC 1) to Moderately Altered (FVC 4).

Units 533-201, -205, and -245 would be seen southwest of the bay. A leave-tree area along the upper edge and a group selection cut would help mitigate visual contrast with the natural landscape in Units 533-201 and -245, respectively. All three units would meet the adopted Maximum Modification VQO and change visual condition from Moderately Altered (EVC 4) to Heavily Altered (FVC 5).

Lastly, Unit 533-251 would be visible south of the bay. It would meet the adopted Maximum Modification VQO while changing the visual condition from Natural (EVC 1) to Heavily Altered (FVC 5).

Alternative 4

This alternative proposes to harvest three units within the Red Bay viewshed. Unit 533-231 would be seen east of the bay. By implementing a seed tree cut, the unit achieves the Maximum Modification VQO, and changes the visual condition from Natural (EVC 1) to Moderately Altered (FVC 4). Unit 533-205 would be apparent southwest of Red Bay. It would comply with the adopted Maximum Modification VQO, while converting an area of Moderate Alteration (EVC 4) into one that is Heavily Altered (FVC 5). Unit 533-252 easily would achieve its adopted Maximum Modification VQO, as it is prescribed to be patch cut and helicopter logged. The Natural (EVC 1) visual condition associated with this unit would be converted to Slightly Altered (FVC 3).

Alternative 6

Three units would appear as middleground landscape elements to viewers in Red Bay. Units 533-205 and -245 would be seen southwest of the bay, where they would meet the adopted Maximum Modification VQO and change the visual condition form Moderately Altered (EVC 4) to Heavily Altered (FVC 5). Unit 533-251 would be seen south of the bay. It would meet the adopted Maximum Modification VQO and convert a Natural (EVC 1) area into one that is Heavily Altered (FVC 5).

Table 3-154

Summary of Proposed Harvest Units Visible within the Red Bay Viewshed

VCU	Unit	Alternatives 2	3	4	5	6	LUD[1]	Distance Zone[2]	Adopted VQO[3]	EVC	FVC	Notes
532	228	+			+		ML	MG	M	1	4	Estuary Buffer Screens Lower Portion
532	231	+	+	+	+		ML	MG	M	1	4	Seed tree
533	201	+	+		+		TP	MG	MM	4	5	Leave-Tree Area along Upper Edge
533	205	+	+	+	+	+	TP	MG	MM	4	5	
533	245	+	+		+	+	TP	MG	MM	4	5	Group Selection
533	251	+	+		+	+	TP	MG	MM	1	5	
533	252	+		+	+		TP	MG	MM	1	3	Helicopter; Patch Cuts.
533	254	+			+		SV	MG	PR	1	3	Helicopter; Patch Cuts.
533	255	+			+		SV	MG	PR	1	3	Helicopter; Patch Cuts.
533	256	+			+		SV	MG	PR	1	3	Helicopter; Patch Cuts.
533	257	+			+		SV	MG	PR	1	3	Helicopter; Patch Cuts.

Table 3-154 (Continued)
Summary of Proposed Harvest Units Visible within the Red Bay Viewshed

VCU	Unit	Alternatives 2	3	4	5	6	LUD[1]	Distance Zone[2]	Adopted VQO[3]	EVC	FVC	Notes
533	258	+			+		SV	MG	PR	1	3	Helicopter; Patch Cuts.
No. Units Visible		12	5	3	12	3						

Source: Suttle 1993

[1] TP = Timber Production; SV = Scenic Viewshed; ML = Modified Landscape.

[2] FG = Foreground; MG - Middleground; BG = Background.

[3] R = Retention; PR = Partial Retention; M = Modification; MM = Maximum Modification

Red Lake
While the areas immediately surrounding Red Lake are in a Scenic Viewshed LUD, areas seen from the lake in the middleground include lands in the Modified Landscape and Timber Production LUD's. As a result, VQO's range from Retention in the foreground to Modification and Maximum Modification in the middleground. Three of the action alternatives propose to harvest timber in one of these middleground areas.

Alternatives 1, 4, and 6
No new harvest is proposed. The visual condition would be unaltered, except for the continuing change in tree height, texture, and color. The existing Visual Condition ranges from Natural (EVC 1) to Slightly and Moderately Altered (EVC 3 and 4, respectively) on middleground slopes visible from the north end of the lake in the Modified Landscape and Timber Production LUD's.

Alternatives 2, 3, and 5
The upper portion of one unit (533-201) would be harvested in the Timber Production LUD west of the lake. It would lie in the middleground distance zone and be apparent from the north end of the lake. It would not be visible from Red Lake Trail or from the recently relocated cabin. A leave-tree area along the upper edge of the unit would allow it to easily achieve its adopted Maximum Modification VQO, while not changing the Moderately Altered (EVC 4) visual condition.

Salmon Bay
This heavily used portion of the Project Area has VQO's of Retention in the foreground and Modification in the middleground distance zone. The shoreline and other portions of the landscape visible in the foreground are Natural (EVC 1), while some middleground slopes are Moderately Altered (EVC 4). All action alternatives would harvest units that are seen from the mouth of the north entry to the bay.

Alternative 1
No harvest activity is proposed by this "no action" alternative. The visual condition would be unaltered, except for the continuing change in tree height, texture, and color.

Alternatives 2, 3, 4, 5, and 6
One unit (534-225) would be harvested on a hilltop visible in the middleground. This unit would meet the adopted Modification VQO and would change the visual condition in its vicinity from Natural (EVC 1) to Moderately Altered (FVC 4).

Exchange Cove
The VQO's associated with this local recreation destination are the result of a Timber Production LUD along the west shore and a Modified Landscape LUD along the east shore. The Partial

Retention and Modification VQO's make up the foreground, while the Modification and Maximum Modification VQO's make up the middleground. Three action alternatives propose harvest within this viewshed (Table 3-155).

Alternatives 1, 3, and 6

No harvest activity is proposed. The visual condition, which varies from Natural (EVC 1) along the east shore to Drastically Altered (EVC 6) along the northwest shore, would remain unchanged, with the exception of continuing change in tree height, color, and texture.

Alternatives 2, 4, and 5

Two proposed harvest units (539-220 and -221) would be visible in the middleground distance zone west of the cove. An estuary buffer would screen lower portions of these units, while the upper edges of both units would be feathered. As a result, they would comply with the adopted Maximum Modification VQO, while changing the visual condition from Moderately (EVC 4) to Drastically Altered (FVC 6).

Table 3-155

Summary of Proposed Harvest Units Visible within the Exchange Cove Viewshed

		Alternatives						Distance	Adopted			
VCU	Unit	2	3	4	5	6	LUD[1]	Zone[2]	VQO[3]	EVC	FVC	Notes
539	220	+		+	+		TP	MG	MM	4	6	Estuary Buffer Screens Lower Part; Upper Edge Feathered
539	221	+		+	+		TP	MG	MM	4	6	Estuary Buffer Screens Lower Part; Upper Edge Feathered
No. Units Visible		2	0	2	2	0						

Source: Suttle 1993

1 TP = Timber Production; SV = Scenic Viewshed; ML = Modified Landscape.

2 FG = Foreground; MG - Middleground; BG = Background.

3 R = Retention; PR = Partial Retention; M = Modification; MM = Maximum Modification

Whale Passage

This saltwater use area is surrounded by lands in the Modified Landscape and Timber Production LUD's. As a result, VQO's within the seen area range from Partial Retention to Maximum Modification. All action alternatives propose timber harvest within the viewshed (Table 3-156). Alternatives 2, 3, and 5 also propose to create a log transfer facility on Thorne Island. Alternatives 4 and 6 would harvest timber from Thorne Island using small patch cuts and helicopter yarding to barges.

Alternative 1

No harvest activity or project-related facilities are proposed by this "no action" alternative. With the exception of continual change in tree height, color, and texture, the visual condition will remain the same. This visual condition ranges from Natural (EVC 1) to Moderately Altered (EVC 4) and includes Natural Appearing areas (EVC 2) that were "A-framed" along the shore of Thorne Island in the 1950's.

Alternatives 2 and 3

These alternatives each propose to harvest fourteen units within the Whale Passage Viewshed. A small portion of Unit 538-208 would be seen from waters near the community of Whale Pass. This unit would meet the adopted Modification VQO and change the visual condition from Moderately Altered (EVC 4) to Heavily Altered (FVC 5). Unit 538-210 would be visible behind Whales Resort in the middleground. A shelterwood cut and a leave-tree area along the edge of this unit help mitigate visual contrasts with the natural landscape. As a result, this unit would easily achieve the adopted Maximum Modification VQO and would leave the Moderately Altered (EVC 4) visual condition unchanged. Units 540-221, -223, and -225 would be seen on the mainland in the middleground distance zone. These units are located north of the Whale Pass community. Unit 540-221 would be mitigated by a shoreline buffer and two leave-tree areas. Units 540-221, -223 and -225 would comply with the adopted Maximum Modification VQO and leave the Moderately Altered (EVC 4) visual condition unchanged.

Units 551-211, -216, -219, -220, -223, -224, -227, -230, and -267 would be harvested on Thorne Island. Four of these, Units 551-211, -219, -227, and -267 would be seen in the foreground. An estuary buffer would screen the lower portion of Unit 551-211, while two leave-tree areas would provide residual structure. A leave-tree area would screen the lower portion of Unit 551-219, portions of which are visible for a long period of time to boaters traveling north. Leave-trees throughout Unit 551-227 would mitigate visual contrasts with the surrounding landscape. A shoreline buffer would screen the lower portion of Unit 551-267, while the west half of this unit has been deferred. Units 551-211, -219, -227, and -267 would each comply with the adopted Partial Retention VQO, while changing visual condition from Natural Appearing (EVC 2) to Slightly Altered (FVC 3). Units 551-216, -220, -223, -224, and -230 would be visible in the middleground on Thorne Island. A leave-tree area would screen a portion of Unit 551-230 allowing it to achieve the adopted Modification VQO and convert an area that is Natural Appearing (EVC 2) into one that is Moderately Altered (FVC 4). Units 551-216, -220, -223 and -224 would also achieve the adopted Modification VQO, but would change Natural (EVC 1) landscapes into those that are Moderately Altered (FVC 4).

This alternative also proposes a log transfer facility, visible on Thorne Island in the foreground. It would not meet the adopted Partial Retention VQO; however, use of a low profile design likely would allow the facility to meet the Modification VQO.

Alternative 4

This alternative proposes to harvest four units (538-210, -221, -223, and -225) on the mainland portion of the Whale Passage viewshed. The visual effect of these activities is described under Alternatives 2 and 3 above.

This alternative would also harvest timber on Thorne Island, using an uneven-aged plan of 109 two-acre patches. No roads, landings, or log transfer facility would be required. Consequently, all activities would achieve a Partial Retention VQO and convert the Natural (EVC 1) and Natural Appearing (EVC 2) landscapes of Thorne Island into one that is Slightly Altered (FVC 3). Helicopters would yard timber to barges in this alternative. Such activity would be visually disruptive to users of the waterway during periods of intensive harvest.

Alternative 5

This alternative proposes to harvest nine units on Thorne Island, as described for Alternatives 2 and 3. The log transfer facility would be constructed, the visual effects of which are described for Alternatives 2 and 3. No units would be harvested in the mainland portion of the viewshed in this alternative.

Alternative 6

Two units (540-223 and -225) would be seen on the mainland portion of this viewshed. Both of these units would meet the adopted Maximum Modification VQO and result in no change to the Moderately Altered (EVC 4) visual condition. This alternative would also harvest Thorne Island, using the uneven-aged plan described for Alternative 4.

Table 3-156
Summary of Proposed Harvest Units Visible within the Whale Passage Viewshed

		Alternatives						Distance	Adopted			
VCU	Unit	2	3	4	5	6	LUD[1]	Zone[2]	VQO[3]	EVC	FVC	Notes
538	208	+	+	+			ML	MG	M	4	5	
538	210	+	+	+			TP	MG	MM	4	4	Shelterwood Leave-Trees On Upper Edge
540	221	+	+	+			TP	MG	MM	4	4	Shoreline Buffer Screens Lower Port Edges Feathered
540	223	+	+	+		+	TP	MG	MM	4	4	
540	225	+	+	+		+	TP	MG	MM	4	4	
551	211	+	+		+		ML	FG	PR	2	3	Estuary Buffer Screen Lower Portion. Two Leave-Tree Areas
551	216	+	+		+		ML	MG	M	1	4	
551	219	+	+		+		ML	FG	PR	2	3	Leave-Tree Area Screens Portion
551	220	+	+		+		ML	MG	M	1	4	
551	223	+	+		+		ML	MG	M	1	4	
551	224	+	+		+		ML	MG	M	1	4	
551	227	+	+		+		ML	FG	PR	2	3	Leave-Trees Throughout
551	230	+	+		+		ML	MG	M	2	4	Leave-Tree Area Screens Portion
551	267	+	+		+		ML	FG	PR	2	3	Shoreline Buffer Screens Lower Portion, West-half Deferred
No. Units Visible		14	14	5*	9	2*						

Source: Suttle 1993

[1] TP = Timber Production; SV = Scenic Viewshed; ML = Modified Landscape.

[2] FG = Foreground; MG - Middleground; BG = Background.

[3] R = Retention; PR = Partial Retention; M = Modification; MM = Maximum Modification

* Thorne Island to be patch cut and helicopter logged

West Coast Waterway

The West Coast Waterway is a long, linear viewshed that takes in Project Area landscapes with LUD II, Special Interest, Modified Landscape, and Timber Production LUD's. Two alternatives would harvest timber from the Modified Landscape LUD, which has adopted VQO's of Partial Retention in the foreground and Modification in the Middleground (Table 3-157).

Alternatives 1, 3, 4, and 6

These alternatives propose no harvest activity within the West Coast Waterway viewshed. The existing visual condition, which ranges from Natural (EVC 1) to Drastically Altered (EVC 6)

would remain unchanged, with the exception of continuing change in tree height, color, and texture.

Alternative 2

Two units would be harvested within the seen area. Unit 531.1-257 lies within the foreground distance zone at the head of Calder Bay. An intervening estuary buffer and the unit's small size (10 acres maximum) allow it to meet the adopted Partial Retention VQO. The associated visual condition would change from Natural (EVC 1) to Natural Appearing (FVC 2).

The upper elevations of Unit 526-217 would be visible in the middleground from Dry Pass. Use of a group selection cut in the visible portion of this unit help it achieve its adopted Partial Retention VOQ.

Alternative 5

One unit, 531.1-257, would be harvested within the West Coast Waterway viewshed. Visual effects created by this unit are described under Alternative 2 above.

Table 3-157

Summary of Proposed Harvest Units Visible within the West Coast Waterway Viewshed

		Alternatives						Distance	Adopted			
VCU	Unit	2	3	4	5	6	LUD[1]	Zone[2]	VQO[3]	EVC	FVC	Notes
531.1	257	+			+		ML	FG	PR	1	2	Estuary Buffer Screens Lower Portion. Ten Acre Max. Size
536	217	+					ML	FG	PR	1	3	Group Selection Harvest In Portion
No. Units Visible		2	0	0	1	0						

Source: Suttle 1993.

[1] TP = Timber Production; SV = Scenic Viewshed; ML = Modified Landscape.

[2] FG = Foreground; MG - Middleground; BG = Background.

[3] R = Retention; PR = Partial Retention; M = Modification; MM = Maximum Modification

Cumulative Visual Effects

Cumulative effects are the results of collective past, present, and reasonably foreseeable future actions. The potential for timber harvest to visually dominate the viewshed is greatest immediately following the activities. In the foreground (up to 1/2 mile), stumps and debris are dominant. Activities such as cut-and-fill slopes, rock pits, and turnouts would be easily seen within several key viewsheds. As viewed in the middleground (1/2 mile to 4 miles), vivid distinction in texture, line and color of the mature forest and the harvest unit would be apparent. Exposed trunks and limbs of the new edges would dominate the visual setting.

By the fifth year of regeneration, the new forest would be filling in with low-lying vegetation (huckleberry bushes, ferns, etc.). On highly disturbed mineral soils, red alder may be present. In the foreground, the visual effects of the clearcut would be evident, but the shrubby vegetation and young trees would begin to cover the stumps and exposed ground. In the middleground, the harvest unit would remain evident, with sharp contrasts in color and texture.

From year 5-20, the young trees would become established, reaching an average height of approximately 15 feet. In clearcut harvest types that include retention of nonmerchantable and

some merchantable trees, the unit would have a rougher texture than a conventional clearcut. The roughness would occur predominantly around the unit edges but would depend on the individual site and the harvest type used. In the middleground, the contrasts between the new forest and mature forest would still be obvious.

At the end of 50 years, the new forest would reach a height of 50-80 feet, depending on site productivity. As seen in the middleground, this stand would be approximately one-half to two-thirds the height of the adjacent mature forest, providing a smoother transition at the harvest unit boundaries. Retained structure within the younger stand would reduce the differences in appearance between the young and mature forests. During this time, the canopy would be closing and the new forest would appear very dense. As a general rule for large harvested areas on steep slopes, the area would appear "near natural" to a casual forest visitor at the end of 50 years. However, areas with smaller units and gentler slopes, such as the Whale Passage Viewshed, would appear "near natural" in about 30 years.

Toward the end of 80 years, the stand would reach 80-90 percent of its mature height. From the middleground, there would be less distinction between this stand and the adjacent mature forest; particularly with retention of trees from the previous harvest.

At 100 years, little visual difference would be noticed between this second growth forest and an adjacent mature old growth forest. It would appear healthy and lush with a full canopy. In the middleground, color and texture of the new forest would allow distinction between it and adjacent overmature forests, which display a scattering of dead tops with generally more irregular differences between individual tree crowns.

Assuming a continuation of the present harvest level (three to five entries per 100 years) and implementation of resource constraints in accordance with the TLMP Draft Revision (1991a), harvest of old growth timber would occur until approximately the year 2054. During this period, the forest would be in a state of obvious change towards meeting a Desired Future Condition that emphasizes landscapes with a mixture of near natural, modified, and highly modified appearances. Following is a description of the anticipated visual condition within each of the eight Priority Travel Route and Use Area viewsheds potentially impacted by the Lab Bay Project.

Alaska Marine Highway and Cruiseship Route

As seen from the Marine Highway (Clarence Strait), color and texture contrasts between the natural landscape and proposed harvest activity would be minimal.

If harvested, nine units visible from the Cruiseship Route (Sumner Strait) would exceed TLMP Draft Revision (1991a) Cumulative Visual Disturbance (CVD) guidelines (see Table 3-158). The visual impacts of these units have been largely mitigated. Little, if any, harvest would be acceptable within this portion of the viewshed in the next entry period. As the second growth matures, the strong line, color, and texture contrasts would diminish and further entries would be possible. Harvest activities would continue to dominate the seen area, but would be designed to be compatible with the natural landscape.

Port Protection

Two Lab Bay units are located on Protection Head in the middleground. Use of group selection harvests and helicopter yarding would result in little visual impact to this prominent portion of the viewshed. Future entries made in the foreground would not be evident to the casual visitor, while those made in the middleground would be small and irregularly shaped to mimic natural patterns.

Red Bay

Numerous Lab Bay units are located within this viewshed, much of which has been heavily (EVC 5) to excessively (EVC 6) altered. If harvested, six of the Lab Bay units would exceed TLMP Draft Revision (1991a) CVD guidelines (Table 3-158). Little or no additional harvest would be acceptable until the second growth attains the color and texture of the natural land-

scape. Until this occurs, a mosaic of harvested and unharvested vegetation would be clearly visible. Future entries would be compatible with the natural landscape.

Red Lake

The upper portions of one Lab Bay unit would be visible on a prominent middleground ridge west of the lake. This ridge has been Moderately Altered (EVC 4) by recent harvest activity. Little, if any, additional harvest activity would be acceptable in the middleground until regeneration occurs on slopes visible to the east and west of the lake. Future entries on these slopes would then be compatible with the natural landscape. The shoreline and scenic slopes visible to the south would remain visually unaltered.

Salmon Bay

One Lab Bay unit would moderately alter (FVC 4) the middleground, as seen from the mouth of the north entry. Adjacent middleground slopes have recently been Moderately Altered (EVC 4). Future harvest would not occur in the middleground until the color and texture of the second growth resembles that of the natural landscape. Future middleground entries would be designed to be compatible with natural form, line, color, and texture. Any harvest along the shoreline (foreground) would not be apparent to casual forest visitors.

Exchange Cove

Portions of the slope west of the cove in the middleground contain large and rectilinear harvest units. Although smaller in size, the two Lab Bay units on this same slope would extend the area of Drastic Alteration (FVC 6). No harvest would be acceptable in this portion of the viewshed during the next entry period. However, harvest could be made during the next entry period along the cove's relatively flat and undisturbed east shore. Future activity in the middleground would dominate the landscape, but would be designed to use naturally established form, line, color, and texture.

Whale Passage

Numerous Lab Bay units would be visible on the mainland and Thorne Island. If conventionally harvested in a single entry (Alternatives 2, 3, or 5), Thorne Island would approach the acceptable CVD levels contained in the TLMP Draft Revision (1991a). Little, if any, additional harvest would be acceptable until the strong line, color, and texture contrasts diminish. If patch-cut and helicopter yarded (Alternatives 4 and 6), minimal contrast with Thorne Island's natural landscape would be created. As a result, additional harvest would be acceptable during the next entry period.

West Coast Waterway

Two Lab Bay units would be visible from this popular travel route, which ranges from natural (EVC 1) to Drastically Altered (EVC 6) in appearance. Future entries would be made throughout the viewshed. While designed to be compatible with the natural landscape, harvest activities would dominate the seen area.

Table 3-158

Summary of Proposed Harvest Activity in Excess of TLMP Draft Revision (1991a) CVD Guidelines

VCU	Unit	Alternatives 2	3	4	5	6	Adopted VQO[1]	EVC[2]	FVC[2]	Viewshed(s)	Notes
529	282	+	+	+		+	M	4	4	Cruiseship	28 Acres
530	226	+		+	+		M	5	6	Cruiseship	Individual Tree Selection on West Edge
530	228	+		+	+		M	5	6	Cruiseship	
530	230	+		+	+		MM	5	6	Cruiseship	
531.1	257	+			+		PR	1	2	West Coast Waterway	Estuary Buffer Screening Lower Portion. 10 acres Max. Size
532	228	+			+		M	1	4	Red Bay	Estuary Buffer Screen Lower Portion; 10 acres Max.
532	231	+	+	+	+		M	1	4	Cruiseship; Red Bay	Seed Tree Cut.
533	254	+			+		PR	1	3	Cruiseship; Red Bay	Helicopter. Patch Cuts.
533	255	+			+		PR	1	3	Cruiseship; Red Bay	Helicopter. Patch Cuts.
533	257	+			+		PR	1	3	Cruiseship; Red Bay	Helicopter. Patch Cuts.
533	258	+			+		PR	1	3	Cruiseship; Red Bay	Helicopter. Patch Cuts.
536	217	+					M	1	3	West Coast Waterway	Group Selection in Visible Area.
Total		12	2	5	10	1					

Source: Suttle 1993

1 PR=Partial Retention; M=Modification

2 1 = Natural; 2 = Natural Appearing; 3 = Slightly Altered; 4 = Moderately Altered; 5 = Heavily Altered; 6= Drastically Altered.

Summary of Effects by Alternative

The following discussion summarizes the effects each alternative would have on the visual resources of the Lab Bay Project Area (see Table 3-159).

Alternative 1 would create no visual effects. Over time, regeneration of second growth stands would change visual conditions, as described in the cumulative visual effects section of this report.

Table 3-159
Summary of Visual Effects

	No. Units Visible by Alternative				
Viewshed	2	3	4	5	6
Cruiseship Route	23	11	14	22	4
Port Protection	2	0	2	2	0
Red Bay	12	5	3	12	3
Red Lake	1	1	0	1	0
Salmon Bay	1	1	1	1	1
Exchange Cove	2	0	2	2	0
Whale Pass	14	14	5[1]	9	2[1]
West Coast Waterway	2	0	0	1	0
Subtotal[2]	57	32	27	50	10
Total[3]	42	25	21	35	7

Source: Suttle 1993.

1 Thorne Island to be patch cut and helicopter logging in Alternatives 4 and 6.

2 Subtotal counts units in more than one viewshed more than one time.

3 Total counts units visible in more than one viewshed only once.

Two units visible within Priority Travel Route and Use Area viewsheds are common to all action alternatives. Unit 533-205 would be apparent to the southwest of Red Bay in each alternative. This harvest area would be visible from the Cruiseship Route and from Red Bay. Unit 534-225, which would be seen from Salmon Bay, also would be harvested in Alternatives 2, 3, 4, 5, and 6.

Several proposed harvest units are visible in more than one Priority Travel Route and Use Area Viewsheds. These include Unit 533-201 (Alternatives 2, 3, and 5) which would be seen from Red Lake, Red Bay, and the Cruiseship Route. Units 527-227, and -228 (Alternatives 2, 3, and 5) are within the Port Protection and Cruiseship Route viewsheds. Units 532-231, 533-245, -251, -252, -254, -255, -256, -257, and -258 would be seen from both Red Bay and the Cruiseship Route. Unit 532-231 would be harvested in Alternatives 2, 3, 4, and 5. Units 533-245 and -251 would be harvested in Alternatives 2, 3, 5, and 6. Alternatives 2, 4, and 5 contain unit 533-252. Lastly, Alternatives 2 and 5 would harvest Units 533-254, -255, 256, -257, and -258.

As shown in Table 3-159, Alternatives 2 and 5 would harvest units within eight Travel Route and Use Area viewsheds. Alternative 3 would harvest no visible units within the Port Protection, Exchange Cove, or West coast Waterway Viewsheds. Likewise, Alternative 4 would have no real visual effects on Red Lake or West Coast Waterway. Alternative 6 would harvest no units visible within the Port Protection, Red Lake, Exchange Cove, or West Coast Waterway viewsheds.

Alternative 2 would harvest 42 units visible within one more viewshed. Alternatives 5, 3, and 4 would harvest 35, 25, and 21 such units, respectively. Alternative 6 would harvest six units visible within one or more viewshed.

As seen in Table 3-158, Alternative 2 would harvest twelve units that exceed TLMP Draft Revision (1991a) CVD guidelines. Alternatives 3, 4, and 5 would harvest two, five, and ten such units, respectively. Alternative 6 would harvest one unit that exceeds CVD guidelines. As noted in the table, many of these units have had visual resource mitigation techniques applied to minimize impacts.

While not a Visual Priority Travel Route or Use Area, visual effects of action alternatives on the mainline road system have been analyzed. Many units adjacent to Roads 15, 20, and 29 employ buffers to reduce or eliminate their visual impacts. Alternatives 2 and 3 would harvest nine units visible along Road 20. Units 533-201, -205, and -245 would be very visible in the Big Creek drainage. Units 533-248, -249, and -250 would be seen near Summit Lake. Users of Road 20 would also see large areas of Units 529-259, -282, and -284 between Lab Bay and Red Bay. Alternative 4 (533-205, -248, -249, 529-254, -282, and -284) and Alternative 5 (533-201, -205, -245, -248, -249, and -250) would each harvest six units. Alternative 6 would harvest seven of the afore-mentioned units (533-205, -245, -248, -249, -250, 529-282 and 529-284).

Mitigation Measures

Several techniques were applied during the planning and design of proposed harvest units to ensure that they complied with TLMP Draft Revision (1991a) visual guidelines. A description of these techniques and their application during the planning process follows:

Avoidance

Potential harvests that would create an unacceptable amount of visual impact and could not be otherwise mitigated were dropped from the unit pool. This occurred in areas seen from Port Protection, Salmon Bay Lake, and Calder Bay.

Manipulating Unit Boundaries

Several proposed units were altered to limit their visibility from key viewing locations. While readily apparent, other units were shaped using curvilinear forms better suited to the natural landscape.

Vegetative Buffers and Reserve Trees

Leave tree islands and buffers were prescribed for numerous units to protect water quality, wildlife, fisheries, and visual resources. Leave tree islands reduced the apparent size of cuts and helped them to more closely resemble natural openings. Vegetative buffers helped screen proposed harvest units from the mainline road system and marine travel routes.

Clearcuts that incorporate leave tree islands can be categorized into four types. Type A would leave safe snags and nonmerchantable timber within a 50- to 100-foot border along unit edges and internal setting boundaries. Similarly, Type B clearcuts would leave a specified number of snags and live trees with minimum diameter limits in the 50- to 100-foot border. Type C clearcuts would leave nonmerchantable trees and safe snags over the entire unit. This type of clearcut could be used with helicopter yarding. An additional benefit of helicopter yarding is the elimination of visual disturbance associated with roads and skid trails. Type D clearcuts would provide clumps of reserve trees in islands or fingers within the unit.

Monitoring

The Forest Plan recognizes three distinct types of monitoring: implementation, effectiveness, and validation. Implementation monitoring determines if projects and activities comply with Forest Plan standards and guidelines. Effectiveness monitoring determines whether the standards and guidelines achieve the desired results. Validation monitoring determines whether the assumptions in the Forest Plan regarding the relationship between management actions and their effects are correct, or if there is a better way to depict these relationships.

A monitoring plan has been developed for the Tongass National Forest by the Forest Planning Team and is described in the TLMP Draft Revision (1991a). The Lab Bay Project Area would contribute towards meeting overall Forest Plan monitoring goals through the selection of proposed harvest units/roads for monitoring. Recommendations for Forest Plan monitoring of visual resources for the Lab Bay Project Area have been documented in the Visual Resource Report (Suttle 1993) and the project planning record.

Project-specific monitoring that is unique to the Lab Bay Project Area that would not be included in regular Forest Plan or routine implementation monitoring, has been identified for several resources. Visual resources are included in project-specific monitoring for the Thorne Island uneven-aged management plan and ecosystem management. These monitoring activities are described in Chapter 2.

Recreation

Key Terms

Recreation Opportunity Spectrum (ROS) - A recreation classification system which uses established criteria to delineate land areas that identify a variety of recreation experience opportunities. Six ROS classes are used to categorize areas (see classes below).

Primitive - An unmodified environment of fairly large size. Interactions between users are very low, and evidence of other users is minimal. The area is essentially free from evidence of human-induced restrictions and controls. Motorized use is not present except for infrequent boats and planes.

Semi-Primitive Nonmotorized - A natural or natural-appearing environment of moderate to large size. Concentrations of users is low, but there is often evidence of other users. No roads are present in the area.

Semi-Primitive Motorized - A natural or natural-appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. Local roads used for other resource management activities may be present, or along saltwater shorelines there may be extensive motorized boat traffic.

Roaded Natural - Resource modification and utilization are evident, in a predominately natural-appearing environment. Interaction between users may be moderate to high, with evidence of other users prevalent. Motorized use is allowed.

Roaded Modified - Vegetative and landform alterations typically dominate the landscape. Recreation structures and facilities may be present, and off-highway vehicle use is allowed. Recreation users will likely encounter timber management activities.

Rural - The natural environment substantially modified by land use activities. High user interaction is expected. Recreation facilities designed for group use are compatible.

Recreation Place - Identified geographical areas having one or more physical characteristics that are particularly attractive to people engaging in recreation activities (e.g. beaches, trails, cabins, campgrounds).

Recreation Site - Specific locations where recreation activities take place; for example, scenic overlooks or anchorages.

Affected Environment

Recreation Setting

The Tongass National Forest's diverse physical and natural resources provide for a great variety of resource-based recreation opportunities. Scattered throughout Southeast Alaska, the Forest offers miles of coastline, mountains, streams, lakes, glaciers, caves, wildlife, and scenery in combinations that allow for recreation activities ranging from wilderness camping to resort cruises and lodging.

North Prince of Wales Island and the Lab Bay Project Area provide many of the resource attributes characteristic of Southeast Alaska in addition to providing some unique opportunities of its own. Past timber management activities on Prince of Wales Island have resulted in over 900 miles of road being developed in the northern part of the Island. This extensive network provides recreational opportunities that are unavailable in other parts of the Tongass. Additionally, the Project Area has a significant number of caves recently discovered as a result of the underlying Karst topography within the region. Recreation opportunities in the Lab Bay Project tend to be concentrated around areas offering exceptional scenic values or unique features, such as Red Bay,

Red Lake, Exchange Cove, Whale Pass, Thorne Island, El Capitan Passage, Calder Bay, Calder Mountain, Salmon Bay and Salmon Bay Lake. The Lab Bay Project Area, in addition to the other resource attributes common throughout the Tongass, provides a variety of recreation opportunities for residents and visitors.

Forest Management Recreation Goals

Recreation management goals for the Tongass National Forest and the Lab Bay Project Area were developed in consideration of multiple-use goals for managing forest resources. The Lab Bay Project Area will be managed to provide a variety of developed and undeveloped recreation opportunities. Because of its roaded character and past timber management activities, the desired future condition for the Lab Bay Area will emphasize roaded and developed recreation opportunities, except in those LUD's where roaded recreation is not allowed. Approximately 67 percent of the Project Area will be managed for recreation opportunities consistent with the management prescriptions identified in the TLMP Draft Revision (1991a) for Timber and Modified Landscape LUD's. Table 3-160 summarizes the nine LUD's within the Project Area, their acreage and general recreation management objectives.

Table 3-160

Summary of Project Area LUD's and Recreation Management

LUD	Acreage[1]	Percent Total[1]	ROS Classes[2]	Timber Management
Special Interest Areas	6,673	3.8	P, SPM, SPNM	Not Suitable
Timber Production	81,478	46.8	RN, RM	Inten. Even-Aged Harvesting
Modified Landscape	47,609	27.3	RN, RM	Grp. Selection, Mod. or Inten. Even-Aged Harvesting
Scenic Viewshed	14,423	8.3	All	Selection, Mod. Even-Aged Harvesting
LUD II[3]	15,842	9.1	P, SPNM, SPM	Not Suitable
Wild River	2,613	1.5	Gen. Primitive	Not Suitable
Scenic River	607	0.3	SPM, SPNM	Selection, Limited Even-Aged Harvesting
Stream & Lake	4,325	2.5	SPM, RN, R	No Harvest, Selection, Moderate Even-Aged Harvesting
Beach Fringe & Estuary	19,295	11.1	SPM, SPNM	Not Suitable

Source: Ketchikan Area GIS

1 Acreages and percents will not equal Project Area totals due to overlap of some LUD's.

2 P = Primitive, SPM = Semi-Primitive Motorized, SPNM = Semi-Primitive Nonmotorized, R = Rural, RN = Roaded Natural, RM = Roaded Modified. Listed ROS classes are recreation management prescriptions possible for given LUD.

3 Several areas within the Mt. Calder/Mt. Holbrook LUD II Area currently have an RM ROS class. This LUD II was defined after management activity occurred there.

Recreation Use

Existing Activities and Use

Recreation in the Project Area includes fishing and hunting, nonconsumptive uses and tourism. Water-based activities, such as motorboating and fishing, have the highest rates of participation among area residents.

Sport Hunting and Fishing

Waterfowl and big game (deer & black bear) hunting are popular in the Project Area. Much of the big game hunting takes place along roadways. Waterfowl hunting occurs around Hole-in-the-Wall, Salmon Bay, Exchange Cove, and Calder Bay. Interior areas around Twin Island and Red Lake are frequented for upland game hunting. The Project Area is also a popular recreational hunting destination for residents from Wrangell, Ketchikan and other nearby communities.

Both saltwater and stream fishing are popular with residents and visitors. Saltwater fishing occurs in many of the small coves and most of the large bays, including Red Bay, Port Protection, Labouchere Bay, and Salmon Bay. Stream fishing focuses on anadromous streams. Anadromous streams that can be accessed by road receive the most use. These include Flicker, Alder, Buster, and Big Creeks in the north, and Neck Lake Creek in the south end of the Project Area.

Nonconsumptive Uses

Nonconsumptive recreation in the Project Area includes beachcombing, hiking, camping, scenic and wildlife viewing, boating, kayaking, picnicking, mountain climbing and caving. Many of these activities occur within the home ranges of communities (within 15 miles), but because of the existing road network, interior areas are also frequented. Visitors also use the Forest Service recreation cabins on Salmon Bay Lake and Red Lake. According to Forest Service records between 1990 and 1992, Salmon Bay cabin had an average 16 parties for 51 days per year of use, and Red Lake had an average of 13 parties for 40 days per year. The Red Lake cabin was about evenly split between local and nonlocal use (averaging 54 percent nonlocal use). Salmon Bay cabin, however, had a significantly higher percentage (87 percent) of nonlocal use. Red Lake's higher local use reflects the fact that the lake and cabin can be accessed by hiking a short trail off Road 20. Few developed picnic or camping sites exist within the Project Area. (Sites are described later). Due to the recent discovery of caves in the Project Area, interest in spelunking and related activities is increasing.

Tourism and Outfitters

The community of Whale Pass contains a fly-in fishing resort lodge as does Port Protection. Cruiseships pass within two miles of the Project Area near Point Baker and along the Sumner Strait shore. Small tour groups have been reported to come ashore on infrequent occasions.

Forest Service Special Use Permits are required by outfitters and guides to conduct commercial services on National Forest System Lands. Forest-wide, the demand for such permits has been growing in recent years. In 1994, at least 20 permits were issued for guided fishing and sightseeing services in the Ketchikan Area, and interest is growing. Ten permits were issued in 1991 by the Ketchikan Area for fishing, eight in 1990, and three between 1985-1989 (USDA Forest Service 1993e).

Within the Lab Bay Project Area, only the Salmon Bay Lake and River have been noted as having interest for guide operations. The District's draft environmental assessment indicates 78 service days of use would be available for guide and outfitter use (USDA 1993e).

Recreation Demand

Recreation activity on Prince of Wales Island has slowly but steadily increased over the past several years. Most of the increase is attributable to the road system and growth in communities, notably Whale Pass. Mainline roads have been improved near Craig and Klawock on central Prince of Wales Island, and road improvements near Thorne Bay presently are underway. These Forest Highway projects are likely to continue to creep northward as logging activity continues to develop roads.

In response to this increasing trend, additional facilities are being planned. Dispersed campgrounds, trails and trailheads are a few of the facilities being considered as part of a recreation planning effort for the Thorne Bay District. While many of the facilities being considered relate to the road system, facilities are also being considered which focus on the area's waterways. These include boat-in campsites, recreation shelters along the West Coast Waterway kayak route, and boating sites.

Recent discoveries of caves in the Project Area have generated considerable public interest (see Geology, Minerals and Karst Resources). Consequently, future demand for recreational access and interpretation of some of these resources is expected to grow. An observation platform recently has been developed at Cavern Lake, adjacent to Road 15. The demand for access to caves will exert greater pressure to improve various road sections, which in turn, will enhance the potential for additional developed recreation. Such a scenario is happening near the El Capitan Cave located in the south end of the Project Area, where a trail was completed in 1994. Private landowners have noted an interest in developing lodging accommodations to support recreationists visiting the cave and nearby sites such as the old marble quarry.

Given the physical and natural resources of the Lab Bay Project Area, and people's interest in driving for pleasure, recreation use on Prince of Wales Island and the Project Area is expected to slowly increase with or without logging activity. According to the Alaska Division of Tourism, capacity and schedule limitations of the ferry system are considered a principal reason for the area's slow rate of increase.

Information about public demand for various recreation opportunities within the Project Area comes from the Alaska Public Survey (1979), TLMP (USDA 1990c) and the Statewide Comprehensive Outdoor Recreation Plan (Alaska DNR 1988). Available information regarding tourist and resident use, preferences, and projected trends indicates that Southeast Alaskans value natural areas with limited development yet with access for fishing, hunting, and hiking. Scenery viewing also is highly valued.

The Project Area will continue to attract visitors, but at the same time logging activities will discourage users who desire more remote experiences. Opportunities for remote experiences presently can be found within the Project Area, but are expected to change over time to activities more dependent on access. This is consistent with the desired future condition for the Project Area which emphasizes timber management.

Those users seeking less-developed recreation opportunities will be displaced to areas not affected by timber harvest activities or road construction. Within the Project Area, these unaffected areas will be restricted to those with LUD's which prohibit timber management: Special Interest Areas, LUD II, Wild River, and Beach Fringe and Estuary (approximately 25 percent of the Project Area). Users will either choose to use these areas, to be displaced to areas outside the Project Area, or to pursue recreation activities suitable to areas with roaded access and modified environments.

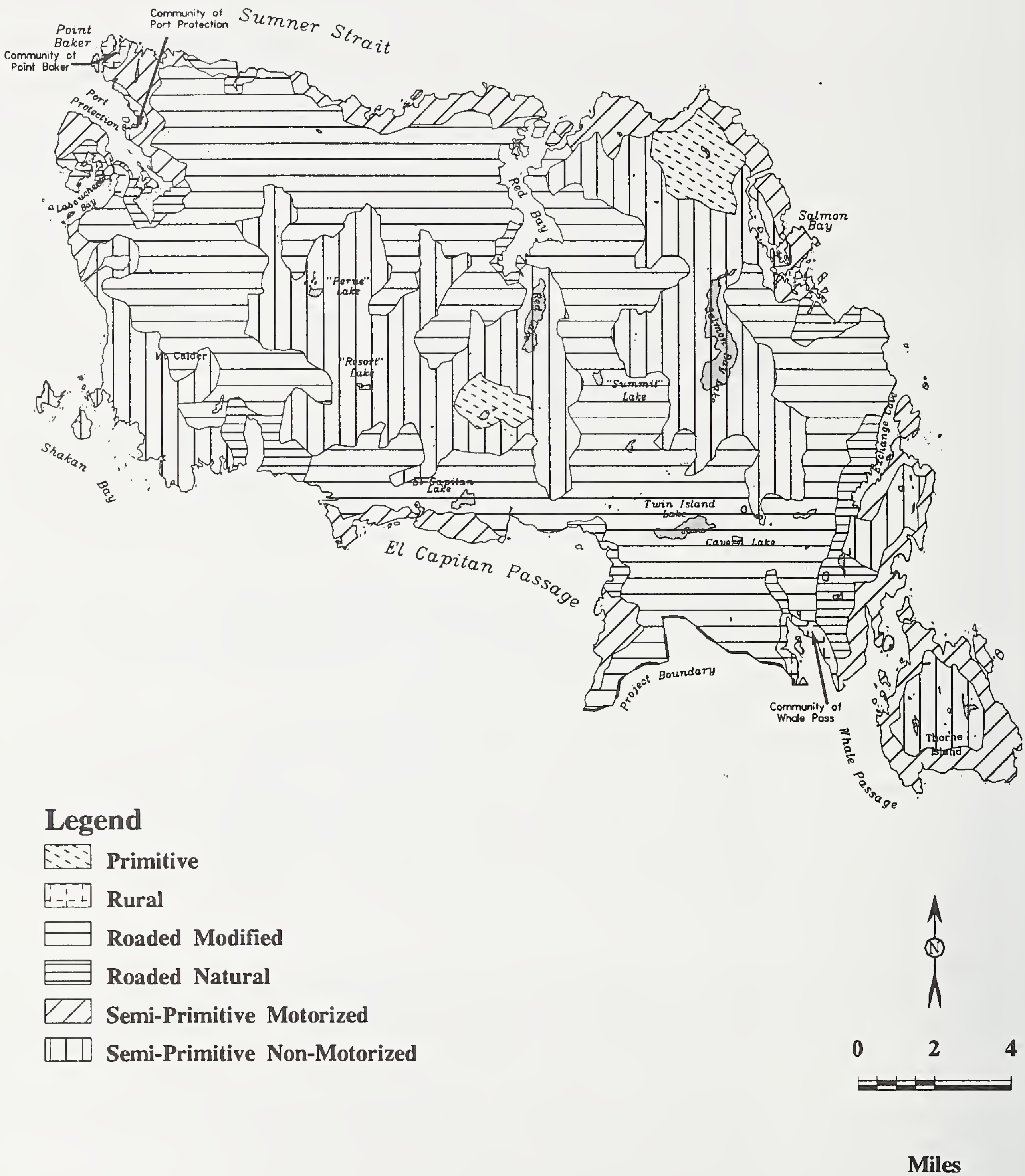
Recreation Inventory

Recreation Opportunity Spectrum (ROS)

The process used to classify recreation opportunities on National Forest System lands is the Recreation Opportunity Spectrum (ROS). The ROS system provides a framework for defining classes of outdoor recreation opportunities ranging from primitive to urban. Each ROS class portrays a range of similar recreation activities, settings, and experiences. Opportunities in the various ROS classes depend on a variety of factors including access, facilities present, amount of landscape modification, and the opportunity for solitude. Figure 3-49 illustrates the ROS classes inventoried within the Project Area. Acreages by ROS class are displayed on Table 3-161.

The historical trend in the Project Area is a shift toward more development, from Primitive ROS to Roaded Modified. The area presently is a mixture of Roaded Modified and Semi-Primitive Nonmotorized ROS classes. Approximately 48 percent of the Project Area is currently inventoried as Roaded Modified, reflecting past logging activity. Next to Roaded Modified, Semi-Primi-

Figure 3-49
Map of Existing Recreation Opportunity Spectrum Classes



Source: Ketchikan Area GIS

Figure 3-50
Existing Recreation Places

Source: Ketchikan Area GIS

tive Nonmotorized currently makes up much of the interior of the Project Area (32 percent). The Semi-Primitive Motorized class buffers much of the coastline, indicative of its attractiveness and access by water. Rural ROS designations surround the communities/camps of Point Baker, Port Protection, Labouchere Bay, and Whale Passage. Roaded Natural settings are scattered throughout the Project Area and generally indicate developed recreation facilities or concentrations of use such as fishing sites.

Two Primitive ROS areas currently exist: one is located northwest of Salmon Bay (north of Salmon Bay Lake); the second occurs north of El Capitan Lake, near Red Bay Mountain (Figure 3-49). Both Primitive areas are presently buffered by Semi-Primitive Nonmotorized settings.

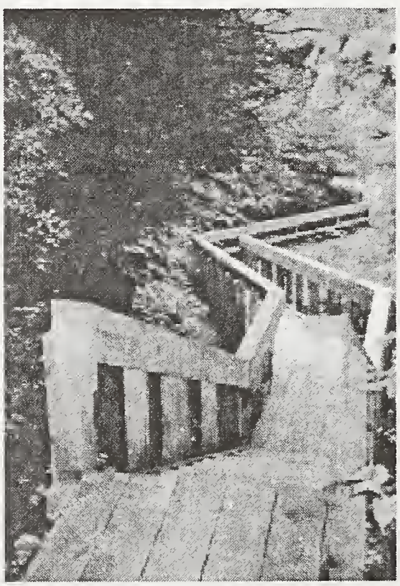
Table 3-161
Recreation Opportunity Spectrum Classes in Project Area

ROS Class	Acres	Percentage
Primitive	4,335	2.5
Semi-Primitive Nonmotorized	55,769	32.0
Semi-Primitive Motorized	20,381	11.7
Roaded Natural	8,433	4.8
Roaded Modified	83,713	48.0
Rural	1,614	1.0
Total	**174,244**	**100.0**

Recreation Places

Recreation Places are geographic areas with one or more physical characteristics attractive to recreation users. These places may be beaches, waterfalls, streams, lakes, scenic features, bays, anchorages, existing and potential recreation sites and trails. Each recreation place has one or more activities associated with it such as hiking, camping, hunting, viewing scenery or wildlife.

As shown in Figure 3-50, 48 recreation places, grouped within 11 geographical areas, have been identified within the Project Area. These places tend to be clustered together, often around areas offering exceptional scenic values, unique features, or areas with easy road access from communities. Table 3-162 describes these places by area, ROS class, existing activities and existing and potential recreation sites. Discussion in this section refers to recreation places as numbered on this table.



Stairway at El Cap cave.

Table 3-162
Recreation Places within the Lab Bay Area

Area	Recreation Place	Acres	ROS	Recreation Activities	Recreation* Sites
Labouchere Bay/ Port Protection	1. West Protection Head	262	RM	B,P,BC	Family Picnic
	2. Protection Head	311	RN	DC	Family Campground*
	3. Lab Bay	241	R	B	Boating Site
	4. Lab Bay Point	56	RM	B,BC	Anchorage
	5. Port Protection South	790	RN	B,BC	Anchorage
	6. Port Protection East	529	SPM	B,BC	Anchorage
	7. Port Protection	315	R	B,BC	Anchorage
Hole-in-the-wall	8. Hole-in-the-wall	1,014	SPNM	B,WH	Anchorage
Sumner Strait	9. Merrifield Bay	132	SPM	B,BC	Anchorage
	10. Memorial Beach	176	RN	P,BC	Family Picnic, Parking
	11. Flicker Creek Bay	223	RN	B,F	Anchorage
	12. Flicker Creek	123	RN	H,F	Trailhead*, Fishing Site
	13. Alder Creek	192	RM	F	Fishing Site
	14. Buster Bay	578	RM	B,BC	Anchorage
Red Bay	15. Red Bay Entrance	278	SPM	B,F,BC	Anchorage
	16. Red Bay	1,099	RM	B,BC,F	Anchorage
	17. Red Bay South	383	RN	BC,WV,F	Anchorage, Fishing Site, Family Picnic*
	18. California Bay	284	SPM	B,BC	Anchorage
Red Lake	19. Red Lake	3,098	SPNM	H,B,F,P,HU,C	Trails,Cabin,Boating Site, Rec. Shelter*
	20. Red Lake South	134	RM	H,HU	Trailhead*
Salmon Bay/Lake	21. Salmon Bay North	306	SPM	B,BC,F	Anchorage
	22. Salmon Bay	2,629	SPM, SPNM	B,BC,F, C,WH,H	Rec. Shelter*, Trail
	23. Salmon Bay South	949	RN	SV,BC	Overlook,Campground*
	24. Salmon Bay Lake	9,170	SPNM	C,H,F,B	Trail, Boating Site, Cabin
	25. Salmon Bay Lake	614	RM	H	
Exchange Cove	26. Entrance West	346	RM	F,B	Boating Site*
	27. Entrance - Island	203	SPM	BC,C	Anchorage, Campsites*
	28. Exchange Cove	1,788	RN	SV,F,BC, WH,DC,WV	Overlook, Dev. Campground Dispersed Campsites*
Whale Pass/ Thorne Island	29. Cove	598	SPM	B,F	Anchorage
	30. Thorne Island	216	SPM	BC,B,C	Angchorage, Disp. Campsites*
	31. Thorne Island	437	SPM	B,BC	Anchorage
	32. Whale Passage	332	R	B,F, Resort Use	Resort, Boating Sites
Twin Island Lake	33. Neck Lake Overlook	236	RM	SV	Overlooks
	34. Neck Lake Creek	251	RN	F	Fishing Site, Overlook
	35. Cavern Lake	535	RM	F,SV	Fishing Site, Overlook

* = Potential recreation sites

ROS Class: R = Rural, RN = Roaded Natural, RM = Roaded Modified, P = Primitive, SPM = Semi-Primitive Motorized,

SPNM - Semi-Primitive Nonmotorized

Activities: P = Picnic, B = Boating, F = Fishing, BC = Beachcombing, C = Dispersed Camping, DC = Developed Camping, H = Hiking, SV = Scenic Viewing, WV = Wildlife Viewing, Cab = Cabin Use, WH = Waterfowl Hunting, HU = Hunting, K = Kayaking, SP = Spelunking, MC = Mtn Climbing

Table 3-162 (Continued)
Recreation Places within the Lab Bay Area

Area	Recreation Place	Acres	ROS	Recreation Activities	Recreation* Sites
	36. Twin Island Lake	2,723	RM	H,C,HU,K	Dispersed Campsite, Dev. Campsite*, Trails, Rec. Shelter*
El Capitan Passage	37. Passage East	618	RN	B,BC,SV,C,K	Anchorage, Rec. Shelter*, Disp. Campsites*, Boating Site*, Dev. Campsite*
	38. Passage North	292	RM	N,SV,SP	Caves, Trailhead*
	39. El Capitan Lake	854	SPM	K,BC,WV,B,C,W	
	40. Dry Pass	778	RM	H	Anchorage*, Rec. Shelter*
	41. Cove	272	RM	K,H,C,B, BC,B,BC	
Calder Bay/ Calder Mtn Area	42. Calder Bay	1,046	RN	SV,WV,C, H,B,W,H	Overlook, Disp. Campsite, Anchorage, Trail
	43. Perue Peak South	2,478	RM		Trail, Trail*
	44. Perue Peak/Lake	3,777	SPNM	H,SV,WV	Trail*
	45. Perue Peak West	239	RM	H,SV,WV	Trail*
	46. Calder Mtn North	599	RM	H,SV,WV	Trail, Trailhead
	47. Calder Mtn South	1,771	SPNM	H,SV, WV,MC	Disp. Campsites*, Trail*
	48. Shakan Bay	2,869	SPNM	H,SV,WV,MC, C,BC,WH,B	

Source: Project Planning Record

* = Potential recreation sites

ROS Class: R = Rural, RN = Roaded Natural, RM = Roaded Modified, P = Primitive, SPM = Semi-Primitive Motorized,

SPNM - Semi-Primitive Nonmotorized

Activities: P = Picnic, B = Boating, F = Fishing, BC = Beachcombing, C = Dispersed Camping, DC = Developed Camping, H = Hiking, SV = Scenic Viewing, WV = Wildlife and Waterfowl Viewing, Cab = Cabin Use, WH = Waterfowl Hunting, HU = Hunting, K = Kayaking, SP = Spelunking, MC = Mtn Climbing

Recreation Opportunities

As noted in Table 3-162, the TLMP Draft Revision (1991a) inventory process identified enhancement opportunities at or near several recreation places; however, none of these were included in the Forest Plan's ten year trail/facility construction-reconstruction list. Additional opportunities were identified during field investigations for this EIS (Suttle 1993), not all of which are connected with existing recreation places. These included:

- Quarry clean-up near Cavern Lake (Recreation Place #35).
- Access to and interpretation of marble quarries near Calder Bay (Recreation Place #42).
- Overlook of Sumner Strait off Road 20 west of Red Bay (near Recreation Place #14).
- Cabin location adjacent to Perue Lake and trail connections (Recreation Place #44).
- Trailhead and trail to Exchange Lake (Recreation Place #28).
- Trail access to Summit Lake from Road 20 (near Recreation Places # 19, 20, 24 and 25).
- Trail connections between Flicker Creek, Memorial Beach and Merrifield Bay (Recreation Places # 10 and 11).

Figure 3-51
Map of Roadless Areas and Salmon Bay Wild and Scenic Eligible Boundaries

Source: Ketchikan Area GIS

- Connection of Roads 29 and 15. This has been an issue for some time. Development of this connection would create a loop road system which would enhance recreation activities. It would, however, displace opportunities for remote experiences now available in this area (Recreation Places # 43, 45 and 46).
- A trail accessing karst lands in the Flicker Ridge/Perue Peak Recreation Area (Recreation Places #44 and 45).
- Shelters and trails connecting the Red Lake trail system and USFS cabin with the El Capitan Peak Recreation Area (Recreation Places #19, 20 and 38).
- Trail system and viewing platforms in the Cavern Lake/Sinkhole Lake Recreation Area (Recreation Place #35).
- Interpretive system for karst/cave ecosystem development in the Beaver Falls Recreation Area (near Recreation Place #36).
- Trail access to a high density of karst features in the Rivers End Recreation Area (near Recreation Places #33 and 37).

Recreation Places Adjacent to Project Area

Neck Lake is located less than a half-mile from the Lab Bay Project Area in the southeast. Neck Lake is a popular recreation place frequented by residents, particularly from nearby Whale Pass. Because timber harvest is presently occurring nearby, Lab Bay harvest activities are not expected to further detract from the recreational pursuits of visitors to this site.

Wild and Scenic Rivers and Roadless Areas

Wild and Scenic Rivers

Rivers on the Tongass National Forest were evaluated in the TLMP Draft Revision (1991a) as to their eligibility for the National Wild and Scenic Rivers System. To be eligible a river must be free-flowing and contain at least one "outstandingly remarkable value". Both Salmon Bay Lake and Salmon Bay River were found to be eligible for inclusion into the system. Salmon Bay Lake was determined eligible for a "wild" classification. Salmon Bay River was determined eligible for "scenic" designation. Figure 3-51 shows the Salmon Bay Lake and River System being considered for inclusion in the Wild and Scenic River System. These areas are being evaluated in TLMP and not in this document.

Roadless Areas

The criteria for identification of a roadless area was established by the Wilderness Act of 1964 and in subsequent regulation and policies. To qualify, an area must contain at least 5,000 acres of undeveloped land which does not contain improved roads maintained for travel by passenger-type vehicles. However, areas less than 5,000 acres may qualify if they are a self-contained ecosystem such as an island, are contiguous to existing wilderness, or are ecologically isolated by topography and manageable in a natural condition. The three proposed roadless areas within the Project Area are described below. Road closures are included in the analyses of alternatives.

The Lab Bay Project Area includes portions of the Calder (No. 516), El Capitan (No. 517) and Salmon Bay (No. 518) Roadless Areas, as identified in the TLMP Draft Revision (1991a). These roadless areas were identified in the TLMP Revision planning process and not by the Roadless Area Review and Evaluation II (RARE II) process. This Lab Bay report evaluates the direct and indirect effects the alternatives may have on the roadless character and wilderness attributes of the three areas. Road closure after harvest is a mitigation measure and is included in the discussion of the effects of the alternatives.

Calder Roadless Area, No. 516

The 11,041 acre Calder roadless area is located on the northwest end of Prince of Wales Island. It is bounded on the north and east by roaded and harvested areas, and the on the west and south by Pacific Ocean and Shakan Bay. Extensive logging on the eastern and northern edges, including the lower slopes of Mt. Calder, alters the natural integrity of the areas. The recreation setting is

semi-primitive, and there is potential for developed and dispersed recreation activities. About half of the area is part of the Mt. Calder/Mt. Holbrook LUD II area. The area contains 1,285 acres of tentatively suitable forestland, and the entire area is included in the KPC Primary Sale Area.

El Capitan Roadless Area, No. 517

This 29,525 acre roadless area is located on the north end of Prince of Wales Island. Roaded and harvested areas are on the north, west, and south sides, while a road forms the eastern boundary separating El Capitan from the Salmon Bay roadless area. Extensive timber harvest along the edge of the area is dominant and reduces the area's natural integrity. The area primarily provides semi-primitive recreation opportunities, most of which are located around Red Lake and its alpine area, and Red Bay Mountain and El Capitan Peak. The area contains 12,482 acres of tentatively suitable forestland and the entire area is within the KPC Primary Sale Area. Additional timber sale projects in the next 10 to 15 years are likely. About 14,000 acres of this area is within the Salmon Bay LUD II area.

Salmon Bay Roadless Area, No. 518

The 25,169 acre Salmon Bay roadless area on the north end of Prince of Wales Island is bounded on three sides by roaded and logged areas. A road forms the west boundary, separating it from the El Capitan roadless area. Most of the landscape remains unaltered by human activity. Outstanding stream and lake fishing, as well as the solitude of Salmon Bay Lake, are recreational attractions. Approximately 11,200 acres of the roadless area are within the Salmon Bay LUD II. The area outside of the LUD II contains 5,174 acres of tentatively suitable forestland. The entire roadless area, excluding LUD II lands, is within the KPC Primary Sale Area. Additional timber sale projects in the next 10 to 15 years are likely.

In addition to the above roadless areas which are completely within the Project Study Area, Thorne Island is included within the Sarkar Lakes roadless area. Most of this 33,335-acre roadless area lies within the Central Prince of Wales Study Area.

LUD II Areas

LUD II Areas surround Salmon Bay and Mt. Calder/Mt. Holbrook. The Tongass Timber Reform Act (1990) directs that these areas be managed in their natural state, as described in the TLMP Draft Revision (1991a). Salmon Bay has been discussed above. The Mt. Calder/Mt. Holbrook LUD II area offers hiking and waterfowl hunting in an area of muskegs and views of Mt. Calder. Many existing cuts are visible in the area. It is used by residents of Labouchere Bay, Point Baker and Port Protection for recreation, and receives heavy subsistence use.

Special Interest Areas

The Special Interest Areas are known for their geological formations, and are generally ringed by lakes, streams and potential trail corridors. Mount Calder's granite dome stands above steep timbered slopes and rock outcrops. This prominent landscape feature occurs in karst topography, offering recreational caving opportunities. North Perue and Perue Special Interest Areas are north of Calder Bay, in relatively undisturbed interior areas. El Capitan Special Interest Area lies south of Red Lake, and is characterized by low, rugged terrain and many small streams. Limestone peaks at Red Bay Mountain and El Capitan Peak dominate the area. Caves found on the west side of the Project Area may have national significance due their unique resource characteristics.

Karst Areas are characterized by sinkholes, caves, collapsed channels, and sub-surface drainage. It is in the alpine and sub-alpine areas where karst topography is best developed, and these areas on north Prince of Wales Island have begun to be surveyed. The karst topography of the Tongass National Forest is unique. Karst areas in the project consist of four units: El Capitan, Perue Peak, North Perue Peak, and Mount Calder. El Cap Pit is the deepest known natural pit in the United States. El Cap Cave has over 10,000 feet of surveyed passages. Northern Prince of Wales Island has the seven deepest known caves in Alaska and the five longest. New caves continue to be discovered and mapped. The Project Area contains possibly hundreds of unexplored and uninventoried caves. These caves and karst areas are attracting ever-increasing recreation use, by

both tourists and residents. The Forest Service has begun to develop portions of these areas for recreation use and is planning additional development.

Effects of the Alternatives

Direct and Indirect Effects

The Lab Bay Project has the potential to provide a wide range of recreation activities, settings, and experiences under each of the Alternatives, consistent with the goals of the TLMP Draft Revision (1991a). Recreation in the Lab Bay area associated with roaded activities will become more prevalent with implementation of the proposed project. This is consistent with the Forest Service's desired future condition for a majority of the Project Area. People choose specific areas for recreation for a variety of reasons and with a variety of expectations. Those seeking primitive recreation may be displaced by nearby timber management activities. Increased road densities could also deter some recreational users, such as hunters. However, the access provided by the associated roads might be appreciated by others. Those users seeking undeveloped areas for recreation would be displaced from much of the Project Area. Only those areas in LUD's which prohibit timber management would be free of harvest. Some of these areas may still experience road construction. The Desired Future Condition of these LUD's is retention of the unmodified natural environments, natural diversity and scenic quality. Some users would need to venture outside the Project Area to find extensive undeveloped areas.

The following analysis of harvest activities proposed within the Lab Bay Project Area summarizes the changes to the existing ROS classes, and the potential effects on existing and potential recreation places and sites.

Recreation Opportunity Spectrum Changes

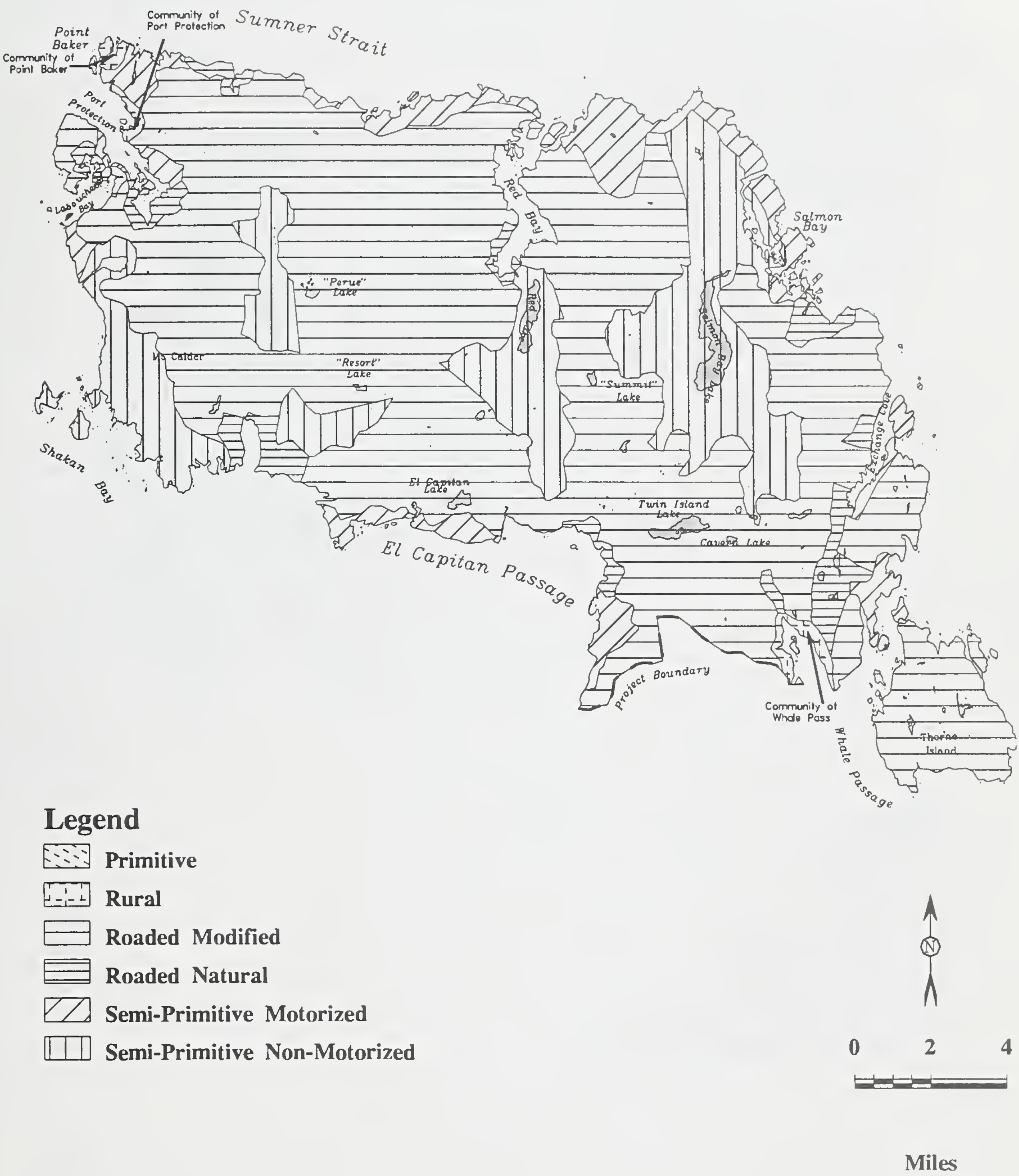
The Project Area's current distribution of Recreation Opportunities is roughly split between motorized/developed ROS settings (54 percent) and dispersed/primitive - semi-primitive rustic settings (46 percent).

Most of the proposed harvest actions would occur in Semi-Primitive Nonmotorized or Roaded Modified ROS classes. The Semi-Primitive Nonmotorized areas undergoing harvesting would change to Roaded Modified. All of the action alternatives would cause a noticeable change in Semi-Primitive Nonmotorized settings within the central and northeast parts of the Project Area. Following road closure, these Semi-Primitive Nonmotorized settings generally would revert from Roaded Modified to a natural appearing environment within one harvest rotation. Primitive ROS settings within the Project Area would also be decreased in size or eliminated by the action alternatives.

Of the action alternatives, Alternative 6 retains the most acres of Primitive (4,024 acres) and Semi-Primitive Nonmotorized ROS settings (40,470 acres). Alternative 2 has the highest amount of Roaded Modified acres (117,567) and consequently the least opportunity among the action alternatives for experiencing solitude.

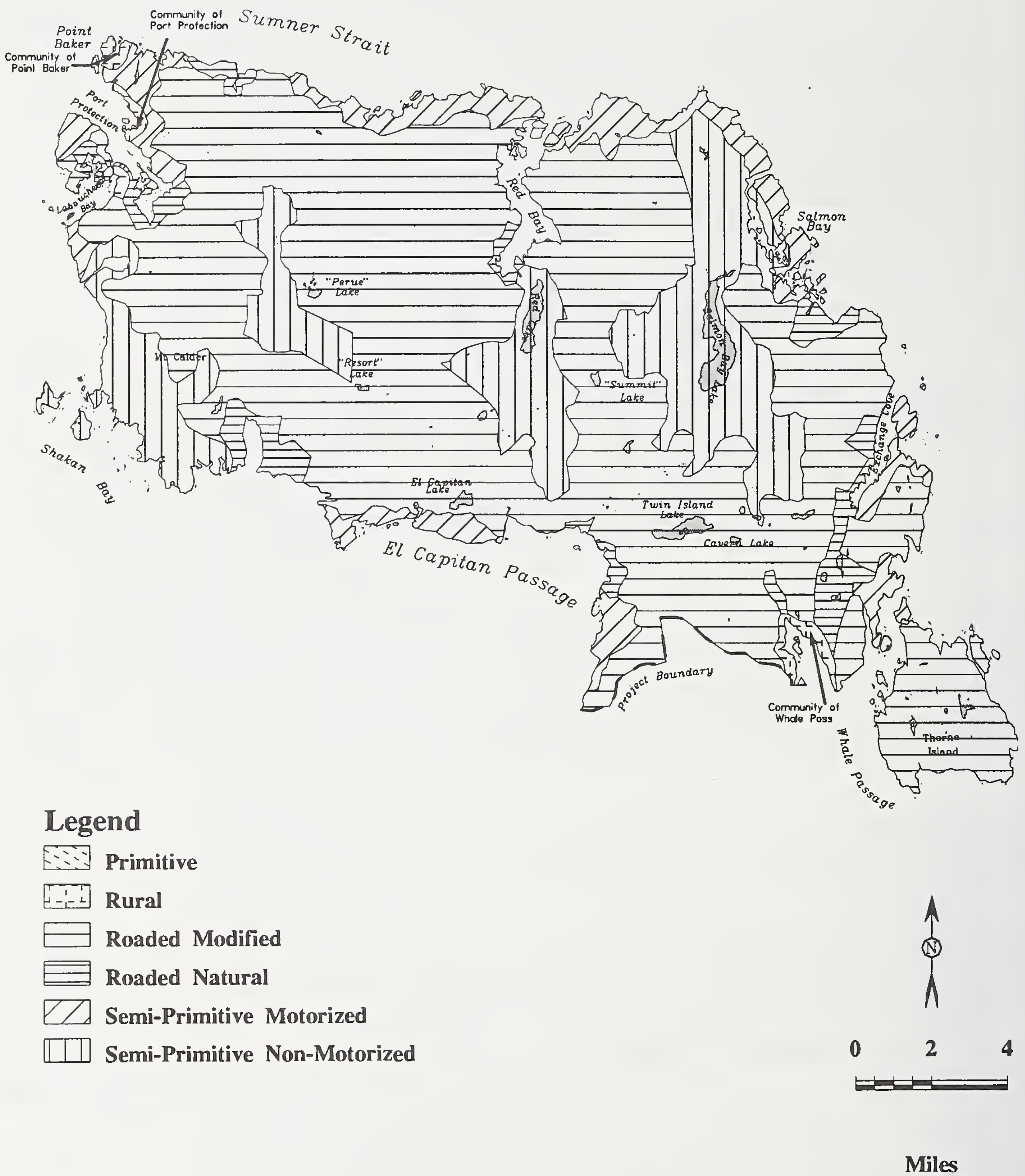
Figures 3-52 through 3-56 show the changes in recreation settings (ROS class) expected to result from the implementation of the various alternatives. Table 3-163 displays the ROS class distribution by alternative. More specific changes in ROS settings by alternative are discussed below.

Figure 3-52
Recreation Opportunity Spectrum — Alternative 2



Source: Ketchikan Area GIS

Figure 3-53
Recreation Opportunity Spectrum — Alternative 3

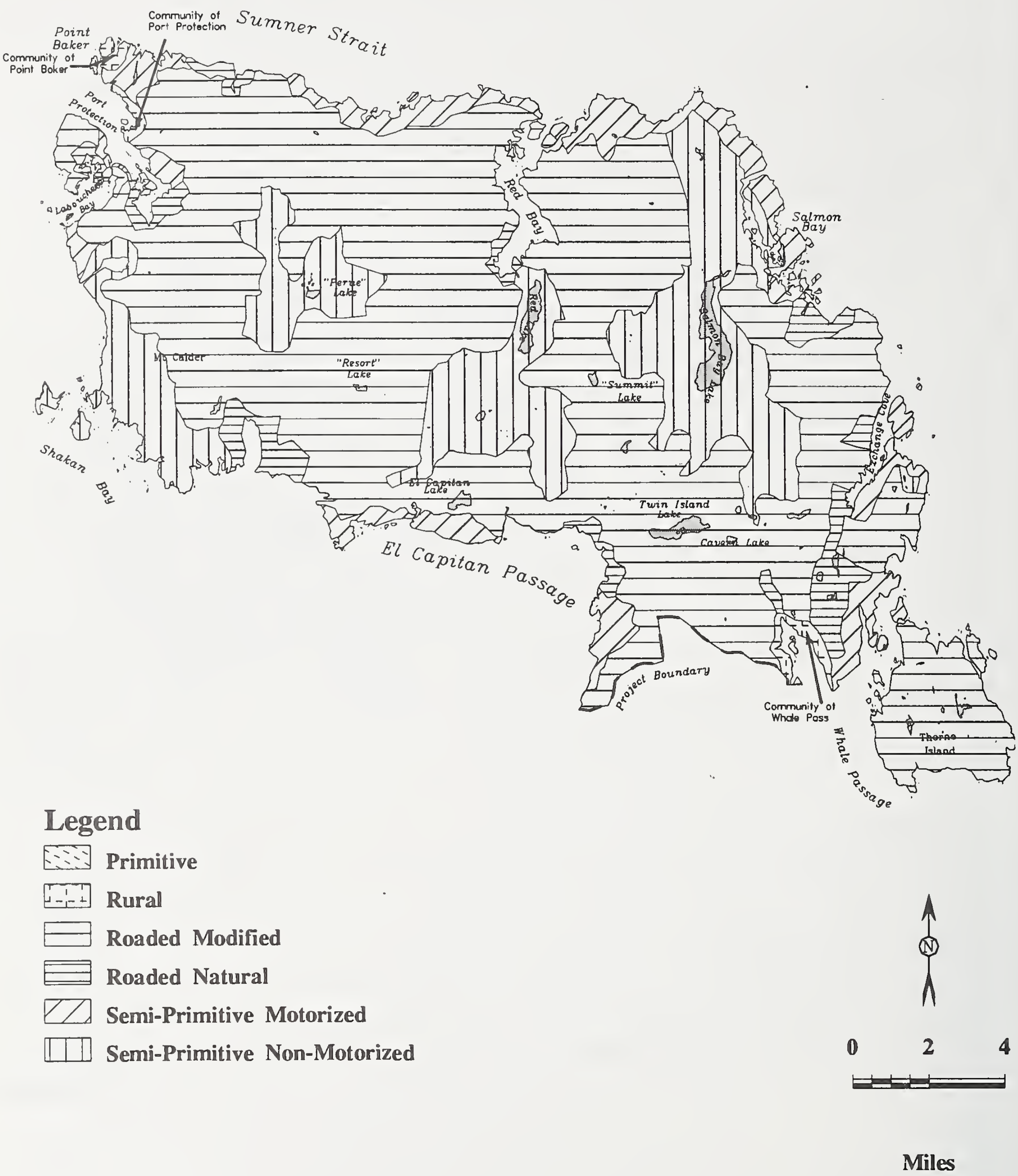


Source: Ketchikan Area GIS

Figure 3-54
Recreation Opportunity Spectrum — Alternative 4

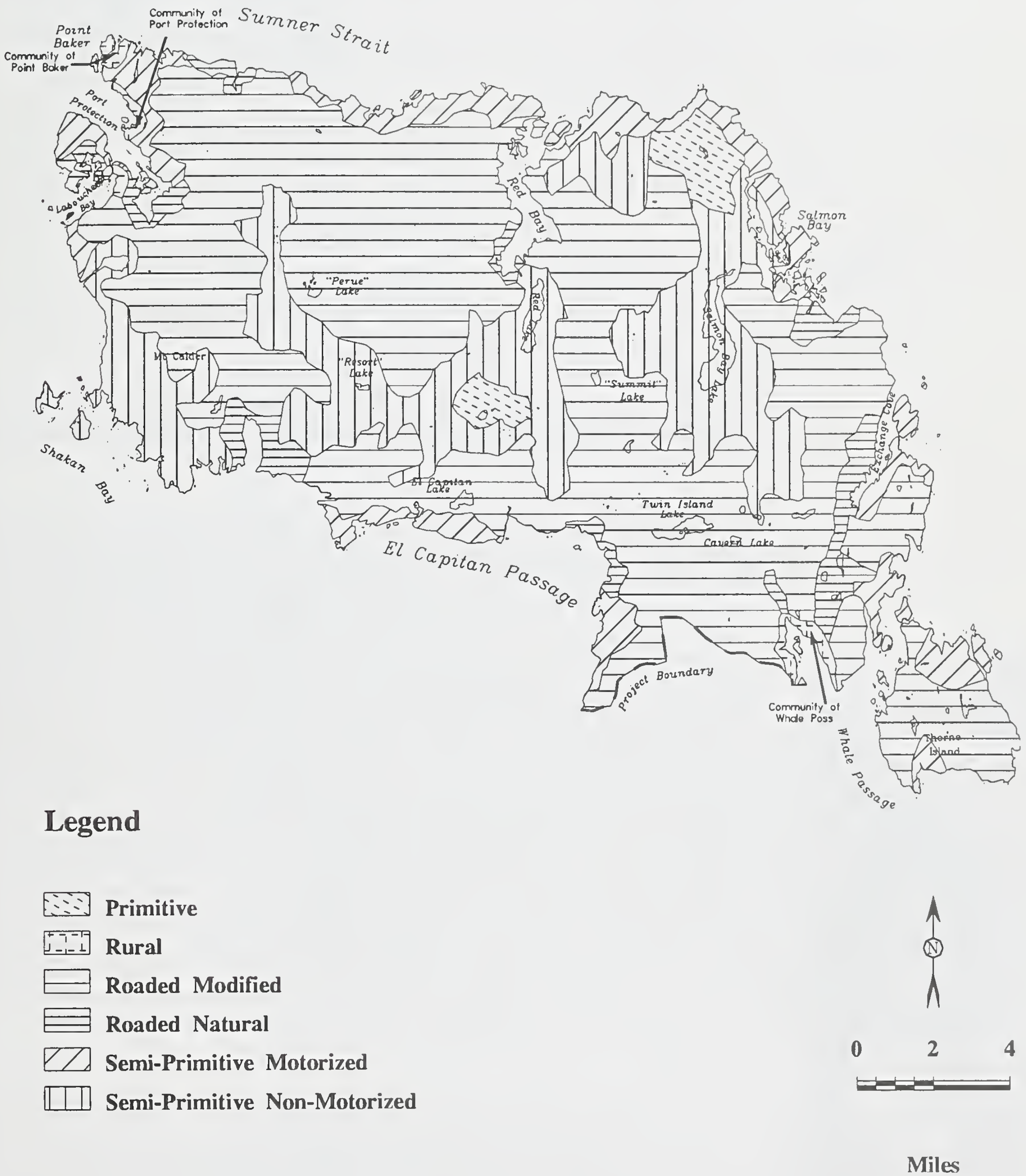
Source: Ketchikan Area GIS

Figure 3-55
Recreation Opportunity Spectrum — Alternative 5



Source: Ketchikan Area GIS

Figure 3-56
Recreation Opportunity Spectrum — Alternative 6



Source: Ketchikan Area GIS

Table 3-163
ROS Class Distribution By Alternative (in acres)

ROS Class	1[1]	2	3	4	5	6
Primitive	4,335	0	0	2,256	0	4,024
Semi-Primitive Nonmotorized	55,769	34,140	34,498	31,008	37,298	40,470
Semi-Primitive Motorized	20,274	13,410	14,387	16,040	13,747	16,550
Roaded Modified	83,713	117,523	115,908	114,980	113,643	103,445
Roaded Natural	8,540	7,558	7,836	8,345	7,942	8,142
Rural	1,614	1,614	1,614	1,614	1,614	1,614

Source: Ketchikan Area GIS

[1] Alternative 1 is essentially the existing condition.

Alternative 1
Under this no action alternative there would be no new timber harvest or road construction. Existing ROS settings and the opportunities for solitude they provide would be retained under this alternative.

Alternative 2
There would be a small shift in acres from Semi-Primitive Nonmotorized to Roaded Modified west of Calder Bay and bordering the Mt. Calder/Mt. Holbrook LUD II area. A small area bordering Calder Bay on the north would change from Roaded Natural to Roaded Modified. A large portion of the Semi-Primitive Nonmotorized area in the center of the project would change to Roaded Modified. Areas to the west and southeast of Red Lake would change from Semi-Primitive Nonmotorized to Roaded Modified. Several areas near Lab Bay and Port Protection would change from Roaded Natural or Semi-Primitive Motorized to Roaded Modified. Portions of the area north of Salmon Bay Lake would change from Primitive and Semi-Primitive Nonmotorized to Roaded Modified and Semi-Primitive Motorized. The area immediately south of Exchange Cove and, most of the area east of the cove, would change from Semi-Primitive Motorized/Semi-Primitive Nonmotorized to Roaded Modified. A portion of the area west of the cove would change from Roaded Natural to Roaded Modified. Several small areas near Buster Bay would change from Semi-Primitive Motorized to Roaded Modified. Thorne Island would change from Semi-Primitive Motorized and Semi-Primitive Nonmotorized to Roaded Modified. An area east of the Whale Pass community would change from Roaded Natural and Semi-Primitive Motorized to Roaded Modified. Both of the existing Primitive areas would change to Semi-Primitive Nonmotorized and Roaded Modified. Alternative 2 results in a shift of approximately 33,800 acres from Semi-Primitive Nonmotorized, Primitive, Roaded Natural and Semi-Primitive Motorized to Roaded Modified. Following road closure, these settings generally would revert from Roaded Modified to a natural-appearing environment within one harvest rotation.

Alternative 3
Both Primitive areas would become a mixture of Semi-Primitive Nonmotorized and Roaded Modified. Most of the Semi-Primitive Nonmotorized area in the center of the project would become Roaded Modified. A large portion of the Semi-Primitive Nonmotorized area north of Salmon Bay Lake would change to Roaded Modified. The Semi-Primitive Nonmotorized and Semi-Primitive Motorized areas south of Exchange Cove and the Semi-Primitive Motorized and Roaded Natural areas near the community of Whale Pass would change to Roaded Modified. Areas to the west and southeast of Red Lake would change from Semi-Primitive Nonmotorized to Roaded Modified. Thorne Island would change from Semi-Primitive Motorized and Semi-Primitive

Nonmotorized to Roaded Modified. Following road closure, these settings generally would revert from Roaded Modified to a natural-appearing environment within one harvest rotation. Alternative 3 results in a shift of approximately 32,200 acres from Primitive, Semi-Primitive Nonmotorized, Semi-Primitive Motorized and Roaded Natural to Roaded Modified.

Alternative 4

Most of the western half of the project would change from Semi-Primitive Nonmotorized to Roaded Modified, except for the area surrounding Red Lake and south of the lake. A large portion of the Semi-Primitive Nonmotorized and Primitive area north of Salmon Bay Lake would become Roaded Modified. The area south of Exchange Cove would change from Semi-Primitive Nonmotorized and Semi-Primitive Motorized to Roaded Modified. Several small areas near Buster Bay would change from Semi-Primitive Motorized to Roaded Modified. An area east of the Whale Pass community would change from Semi-Primitive Motorized to Roaded Modified. Following road closure, these settings generally would revert from Roaded Modified to a natural-appearing environment within one harvest rotation. Both of the existing Primitive areas would change to Semi-Primitive Nonmotorized and Roaded Modified after implementing Alternative 4. Alternative 4 results in a shift of approximately 31,300 acres from Primitive, Semi-Primitive Nonmotorized, Semi-Primitive Motorized and Roaded Natural to Roaded Modified.

The proposed Thorne Island uneven-aged management plan would helicopter log in scattered two-acre areas, mitigating visual impacts on Recreation Place #30 and #31, and on Whale Pass residents and visitors. Recreation Place #30, #31 and most of Thorne Island would shift from Semi-Primitive Nonmotorized and Semi-Primitive Motorized to the Roaded Modified ROS setting as a result of harvest activities. Two areas of Semi-Primitive Motorized ROS, totalling approximately 2,000 acres, would remain. Even though harvesting would be accomplished by helicopter, the ROS would change to Roaded Modified for harvested areas due to vegetative alteration. It would remain as Roaded Modified until regeneration returned the landscape to a natural-appearing environment, generally for the length of one rotation. Since the plan calls for a 15-year re-entry period, the return to Semi-Primitive ROS settings likely would not be completed during the rotation.

Alternative 5

A large portion of the Semi-Primitive Nonmotorized area north of Salmon Bay Lake would change to Roaded Modified. The area immediately south of Exchange Cove would change from Semi-Primitive Motorized/Semi-Primitive Nonmotorized to Roaded Modified. Thorne Island would change from Semi-Primitive Motorized and Semi-Primitive Nonmotorized to Roaded Modified. A Semi-Primitive Motorized area northwest of Lab Bay would become Roaded Modified. A small portion of the Semi-Primitive Motorized area east of Port Protection would change to Roaded Modified. A large portion of the Semi-Primitive Nonmotorized area in the center of the project would change to Roaded Modified. A small area just west of Red Bay would change from Semi-Primitive Motorized to Roaded Modified. Both Primitive areas would change; the area south of Red Lake to Semi-Primitive Nonmotorized, and the area north of Salmon Bay Lake to Semi-Primitive Nonmotorized and Roaded Modified. Thorne Island would change from Semi-Primitive Nonmotorized and Semi-Primitive Motorized to Roaded Modified. Following road closure, these settings generally would revert from Roaded Modified to a natural-appearing environment within one harvest rotation. Alternative 5 results in a shift of approximately 30,000 acres from Primitive, Semi-Primitive Nonmotorized, Semi-Primitive Motorized and Roaded Natural to Roaded Modified.

Alternative 6

Portions of the Semi-Primitive Nonmotorized area near "Perue" Lake would change to Roaded Modified. Small areas just west of "Summit" Lake and east of Read Bay also would be converted from Semi-Primitive Nonmotorized to Roaded Modified. Primitive and Semi-Primitive Motorized areas north of Salmon Bay Lake would change to Roaded Modified. The Semi-Primitive Nonmotorized and Semi-Primitive Motorized areas south of Exchange Cove would change to Roaded Modified, as would the Roaded Natural and Semi-Primitive Motorized areas east of the

Whale Pass community. The uneven-aged management plan for Thorne Island would alter ROS settings, as described for Alternative 4. Alternative 6 results in a shift of about 19,700 acres from the Primitive, Semi-Primitive Nonmotorized and Roaded Natural settings to Roaded Modified.

Effects On Recreation Places

Harvest units, road construction, dust and noise occurring within Recreation Places which currently are in Primitive, Semi-Primitive Nonmotorized or Semi-Primitive Motorized ROS classes generally would cause a shift to a Roaded Modified class. Consequently, this would cause a shift from recreation opportunities for solitude toward those with a higher probability for interaction with others and potential for recreation facility development.

The proposed action alternatives would not change recreation settings and activities for the majority of the 48 inventoried Recreation Places. Slight changes are expected to occur in ROS settings for some Recreation Places in the Exchange Cove, El Capitan, Lab Bay and Sumner Strait areas. In these areas, several Semi-Primitive Motorized and Semi-Primitive Nonmotorized classes would change to Roaded Modified designations, because their size would be too small to meet Semi-Primitive Motorized and Semi-Primitive Nonmotorized criteria after harvesting activities are completed within surrounding areas.

The largest changes to recreation settings resulting from several of the alternatives include the interior areas associated with Recreation Places around Calder Mountain and Red Lake and changes to the Semi-Primitive Nonmotorized and Semi-Primitive Motorized settings on Thorne Island. The potential effects on Recreation Places are described below for each alternative. Numbers in parentheses are for reference to Table 3-161 and Figure 3-50.

Labouchere Bay Area

Proposed harvest activity within the Labouchere Bay area would change Recreation Place ROS settings from predominately Roaded Natural and Rural to Roaded Modified south of the community. Proposed Units 527-224, and -227 to -229 would change the ROS settings, and are included in Alternatives 2, 4 and 5. Harvest activity proposed for Protection Head would change that area's ROS setting from Semi-Primitive Motorized to Roaded Modified for Alternatives 2 and 5. This may cause some residents to avoid these areas for recreational pursuits until the second growth matures and causes the ROS setting to move back to Semi-Primitive Motorized. Former harvest roads are now used by residents for access to the area. Proposed Units 527-206 and -226 would not directly affect the Port Protection Recreation Place (#7), as they have been designed to minimize visual effects and windthrow potential; however, their proximity may displace users seeking nearby hiking opportunities in relatively undisturbed areas. These units would cause a shift in the existing ROS setting from Semi-Primitive Motorized to Roaded Modified in the immediate area around the units. Only Alternatives 2 and 5 would include these 2 units. Recreation Places 5, 6, and 7 (all anchorages) could be affected by noise, road construction, and disruption of solitude in the vicinity of Units 527-206, -224 and -226 during harvest activities. All roads connected with harvest of these units are to be closed upon completion of harvest activities. Units 527-227 and -228 would have a 500-foot no-harvest buffer to decrease visual impacts from the beach.

Sumner Strait Area

This area contains several recreation places popular with local residents. Merrifield Bay (#9), a popular anchorage, would not be affected. Several small harvest units are proposed in Alternative 3 near the Memorial Beach, Flicker and Alder Creek Recreation Places (#'s 10-13). These units would be screened from the water and are not expected to affect the recreation opportunities or settings of these places which already have roaded access. Part of Recreation Place (#14) to the west of Buster Bay would change from a Semi-Primitive Motorized to a Roaded Modified ROS setting as a result of harvest Unit 530-203 proposed in Alternatives 2 and 4. This unit and associated road development cause the Semi-Primitive Motorized ROS setting west of Buster Bay to no longer meet the size requirements for a Semi-Primitive Motorized setting. Consequently, the area would change to Roaded Modified. Unit 530-241 proposed in Alternatives 2 and 4 has the potential to provide a scenic overlook of Sumner Strait. Unit 529-286 proposed in Alternatives 2

and 4 would cause a change in the ROS setting in the vicinity of Memorial Beach from Roaded Natural to Roaded Modified. This change is not expected to adversely affect use of the site as visitors now travel through Roaded Modified areas to reach the beach. This unit may, however, visually affect users of a trail connection being proposed by the Community of Point Baker. The proposed trail would extend from Flicker Creek west past the unit to Merrifield Bay. Picnicking and hiking activities could be affected by noise, dust and traffic during harvesting.

Harvest Units 529-256, -257 and -259 proposed in Alternatives 2, 3, and 4, with 529-256 also proposed under Alternative 6, are located well away from the Sumner Strait shore. These units would not change the area's current Roaded Modified ROS setting but would prolong this ROS setting which is currently moving toward a Roaded Natural setting as a result of the proximity to Road 20. These units may increase fishing access to Alder Creek. All roads connected with harvest of units in this area are to be closed after harvesting.

Red Bay Area

Harvest Units 532-228 and -229 in Alternatives 2 and 5 would indirectly affect Recreation Places adjacent to Red Bay. These units would change the ROS from Semi-Primitive Motorized to Roaded Modified near Red Bay South (#17). This recreation place is used as an anchorage, fishing site, and family picnic area. Harvesting activities would produce dust, noise and traffic that could interfere with recreation activities for the duration of harvesting. Previous harvest has modified the area around Red Bay. Hiking and beachcombing are not affected, nor are the recreation anchorages. Units proposed near California Bay (#18) in Alternatives 2 and 5 would cause the ROS setting south of that Bay to change to a Roaded Modified category from its present Semi-Primitive Nonmotorized and Primitive settings, but would not change the Bay's existing Semi-Primitive Motorized setting. Roads connected with harvest of these units are to be closed after harvesting activities are over.

Red Lake Area

One unit (533-201), located outside and to the west of the Red Lake drainage, would intrude on the Lake's viewshed. This unit would be harvested with a leave-tree area along the upper edge to soften visual effects. While visible to boaters from the north end of the lake, this unit would not be visible from the Red Lake Trail or the recently relocated recreation cabin. Therefore, hiking and lake activities in the immediate vicinity and around the cabin would not be affected by proposed harvest actions, except possibly by short-term noise. None of the harvest units south of Red Lake would be visible from the lake itself.

Proposed harvest activity in several of the alternatives would reduce the Semi-Primitive Nonmotorized setting surrounding Red Lake. Units proposed in Alternatives 2, 3 and 5 would cause Semi-Primitive Nonmotorized ROS settings west and southeast of the Lake to shift to Roaded Modified settings. Many of the units located to the south of the Lake are proposed to be harvested by helicopter. These units would reduce the opportunity for solitude in relatively undisturbed settings until second growth becomes natural appearing. Until then, those seeking such solitude would be displaced. Additionally, the noise during harvesting would affect those looking for an undisturbed setting.

Salmon Bay Lake Area

No harvest activities are proposed within this rustic area used for boating, fishing, hiking, camping, and scenic viewing. Several past harvest activities are visible from the Lake, but much of the area remains in a Semi-Primitive Nonmotorized ROS setting. Units 534.1-211, 534.1-212, (Alternatives 2, 3, 4, and 5), 534-225, -226 (all action Alternatives), and 534-228 (Alternatives 2, 4, 5, and 6) may cause an increase in the use of the Salmon Bay River and surrounding area, due to the increased vehicular access possible from the roads. One or more of these units are proposed in all the action alternatives. The dust, increased traffic and noise during harvesting would decrease the opportunity for an undisturbed setting in the vicinity of these units.

Exchange Cove Area

Slight changes in the ROS setting would occur in the Exchange Cove area. Harvest Units 539-220 and -221, proposed in Alternatives 2, 4 and 5, would cause a change in the Roaded Natural setting since the units are located adjacent to the Exchange Cove Road. The setting would shift to a Roaded Modified class. Estuary buffers would screen the lower portion of the unit and decrease visual impacts; however, dust, traffic and noise from harvest activities would affect users of the Exchange Cove Recreation Place (#28). These uses include scenic viewing, fishing, hunting and developed camping. Some of these opportunities may be displaced for the duration of the harvest period (3-7 years). Hunting may increase as a result of increased accessibility. Unit 539-222 (Alternatives 2, 4, 5, and 6) would be buffered so it wouldn't be viewed from the existing campground. Harvest Unit 539-210 (Alternatives 2, 3, 4, and 6) provides the potential to construct a trailhead near Exchange Lake. This harvest unit is not expected to adversely affect recreation as the area is presently in a Roaded Modified setting.

The ROS setting of Semi-Primitive Nonmotorized located east of the Cove would change to the Roaded Modified setting primarily due to harvest activity under other contracts. Units proposed along the Kashevarof Passage side of this peninsula in all the action alternatives would cause a shift from the Semi-Primitive Motorized setting to Roaded Modified for that immediate area. Recreational opportunities associated with these more primitive settings would be displaced to other locations or delayed until second growth matures. All roads connected with these units are proposed to be closed after harvest.

Whale Pass/Thorne Island Area

Harvest units would not change the ROS setting in the vicinity of the Whale Pass community, which is presently classified Rural. However, one unit (538-210) proposed in Alternatives 2, 3 and 4 may affect recreation activities at a nearby resort lodge. The proposed unit is in an area noted by the resort owners to be used for hiking by their clients. Noise, dust, and traffic would be generated by this harvest activity. It is proposed to retain a triangular island of timber between landings in the upper boundary to mitigate visual impacts.

The narrow cove north of Whale Pass (#29), popular for boating and fishing, would change from Semi-Primitive Motorized to Roaded Modified as a result of harvest activity proposed in Alternatives 2, 3, 4, and 6. Recreation activities, which occur mainly on the water, are not expected to diminish. However, the opportunity to participate in such activities in a near-natural setting would be lost until second growth matures.

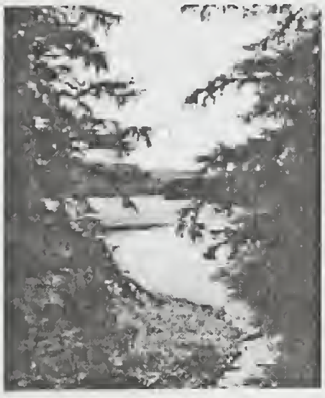
Units 551-227, -267, and 540-221 would be harvested with a 500-foot shoreline buffer to mitigate impacts. Unit 551-211 would retain two areas of unmerchantable timber and a 1000-foot estuary buffer to mitigate visual impacts. Unit 551-224 offers possible recreation fishing opportunities.

Recreation Places #30 and #31 and all of Thorne Island would shift from Semi-Primitive Nonmotorized and Semi-Primitive Motorized to the Roaded Modified ROS setting as a result of harvest activity in Alternatives 2, 3, and 5. Opportunities to experience recreational pursuits in near-natural conditions would be displaced until harvested sites mature.

The proposed Thorne Island uneven-aged management plan in Alternatives 4 and 6 would helicopter log small patches to mitigate impacts. This management plan would decrease the visual impacts to Recreation Places #30, #31 and to Whale Pass residents and visitors. Approximately 2,000 acres in Semi-Primitive Motorized settings would remain.

El Capitan Passage Area

Slight changes to Recreation Place ROS settings would occur within the El Capitan Area. Harvest units are located in three of the Recreation Places, but only the Recreation Place south of El Capitan Lake (#39) would change from its Semi-Primitive Motorized setting to a Roaded Modified setting as a result of the cutting of Unit 536-217 in Alternative 2. Several of the dispersed recreation activities enjoyed in this recreation place would be displaced until the second growth matures. These activities, which include kayaking, dispersed camping and wildlife viewing, would



also be disrupted by the noise, dust and traffic during harvesting. Recreation Places #40 and #41 could also be impacted. The road connected with harvest of this unit is to be closed.

Calder Bay/Calder Mountain Area

All of the alternatives would cause large acreage changes in the recreation setting to the interior of this area. Most of the area immediately around Calder Bay would retain its existing Roaded Natural setting, since harvest units have been deferred from the area or relocated outside of its viewshed. Alternative 2 would create slight changes in the northwest corner of Calder Bay (#42), shifting the current Roaded Natural setting to Roaded Modified as a result of harvesting of Unit 531.1-213. Recreation activities at this popular anchorage, overlook, campsite and hiking area would be affected by dust and noise during harvesting. Additionally, activities at Shakan Bay (Recreation Place #48) would be impacted by noise and dust. Unit 531.1-257 (Alternatives 2 and 5) would be harvested with a maximum size of 10 acres and a 1000-foot estuary buffer to mitigate visual impacts to Calder Bay.

Proposed activities in all the alternatives within the "Perue" Peak/Lake Recreation Place (#44) would cause much of the Semi-Primitive Nonmotorized to shift to a Roaded Modified setting. In the vicinity of "Perue" Lake, six proposed units would affect areas identified for trail potential (recreation places #43, 44 and 45). Units 529-212 (all Alternatives), -214, -215 (Alternatives 2, 3, 5, and 6), -218 (Alternatives 2, 3, and 6), -220 (Alternatives 2 and 4) and -223 (Alternatives 2, 3, 4, and 6) would reduce the attractiveness of the area for dispersed recreation activities within a natural setting. Road access would reduce opportunities for the solitude now possible within the Semi-Primitive Nonmotorized setting. Subsequent entries into these areas would eliminate use of second growth. Road development associated with the harvest units, however, would increase the opportunity for access into the area. Opportunities to create trailheads near units located south and north of the lake would help realize a proposed loop trail connection. New access into the area may be viewed as a positive or negative effect depending on the perception of the user. Generally, however, the degradation of solitude and the natural setting is viewed as a negative recreation effect. Harvest activities would generate dust, noise and traffic which diminish solitude in the area during harvest. Harvest units and road development in this area also would create the potential to provide access to nearby caves. Again, this may be viewed as a positive or negative effect of the project. Access to this area will be determined through Road Management Objectives. Unit 531.1-242 would be helicopter logged in Alternatives 2, 3, 4, and 5. Roads associated with the other harvest units are to be closed after harvest activities are finished.

Calder Mountain (Recreation Place #47) is a very scenic setting and one of the few sites within the Project Area popular for mountain climbing. A part of this Place would change to Roaded Modified from its Semi-Primitive Nonmotorized setting with the harvest of Unit 531.1-205 proposed in Alternatives 2 and 5. Unit 531.1-208 (also in Alternatives 2 and 5) would affect Recreation Place #46 adjacent to #47. In addition to mountain climbing, these places are popular for hiking, scenic and wildlife viewing. Dust, traffic and noise from harvesting would affect these activities for the duration of harvesting activities. A road constructed for harvest of these units would provide a hiking route and increased access to the mountain climbing recreation site.

Effects on Wild and Scenic Rivers

No harvest units are proposed within the current boundaries of the Salmon Bay Lake area currently being considered for "Wild" designation nor within the "Scenic River" designation being considered for the Salmon Bay River (TLMP Draft Revision 1991a).

Effects on Roadless Areas

Alternatives 2, 3, 5, and 6 propose harvest in the Calder (No. 516), El Capitan (No. 517) and Salmon Bay (No. 518) roadless areas. Alternatives 2, 3, and 5 would also conventionally harvest timber from Thorne Island, which is within the Sarkar Lakes roadless area. Alternative 4 would not harvest within the Calder roadless area and would helicopter log small, scattered patches on Thorne Island. Alternative 6 would also helicopter log small, scattered patches on Thorne Island. A number of units would be spread throughout the El Capitan roadless area in each action alternative, changing much of its Semi-Primitive Nonmotorized setting to a Roaded Modified class.

Alternatives 2, 3, 4, and 5 would eliminate the Primitive ROS setting that exists within the El Capitan roadless area. Units within the Salmon Bay roadless area are concentrated in its northern half, north of the Salmon Bay LUD II area. These units would cause a noticeable reduction in the Primitive ROS setting. Most of the roadless areas within the Project Area would be altered by harvesting and road construction. However, closure of most new roads after harvest would decrease the time required for return to a natural setting. Alternatives 2, 3, and 5 would create the most change. Only a small portion of the roadless areas not already set aside in LUD II would remain roadless at the end of the harvesting cycle for these alternatives. This is consistent with the desired future condition for the Project Area.

Table 3-164 shows the total acres and the proposed harvest acres within the Project Area's inventoried roadless areas.

Table 3-164
Alternative Harvest Acres in Project Roadless Areas

		Proposed Harvest Acres by Alternative					
Roadless Area	Acres	1	2	3	4	5	6
Calder Roadless Area	11,041	0	258	60	0	170	60
El Capitan Roadless Area	29,525	0	1,581	1,114	1,072	1,110	680
Salmon Bay Roadless Area	25,169	0	581	530	581	517	378
Thorne Island[1]	7,295	0	605	605	218	605	218

Source: Ketchikan Area GIS

1 Within Sarkar Lakes Roadless Area

Effects on Outfitter and Guide Operations

A number of outfitter or guide operations are active within the Lab Bay Project Area. Continued logging activity within the area is likely to discourage such operations, except for activities in the Salmon Bay River area. Forest Service Outfitter and Guide Environmental Assessments indicate some interest in the Salmon Bay River. Possible future development of some of the karst/cave resources for recreational and scientific pursuits could increase guide and outfitter operations in the Project Area. Interest has already been expressed in priority guide and outfitter services connected with some of the karst resources.

Cumulative Effects

Cumulative effects assess the total impact of harvest activities on recreation resources from 1954 to 2054. Several assumptions have been made for this assessment: LUD assignments remain the same over time; timber volume requirements can be met while complying with the terms of the Tongass Timber Reform Act (1990); and the TLMP Draft Revision (1991a) standards and guidelines, as well as tourist and resident use and growth trends, will remain as described. Long-term management of recreation resources may vary as a result of adoption of a revised Forest Plan. The 1996 TLMP Draft Revision presents options for consideration and describes their anticipated effects.

In 1954, Prince of Wales Island was primarily undisturbed and unroaded. Harvest activities since then have brought road construction, community development, and recreation opportunities of both a dispersed and developed nature. Roaded access attracts both residents and tourists to recreation places.

The cumulative effects of the proposed actions to the year 2004 (the end of the 50-year contract) would be to decrease recreation opportunities in Primitive and Semi-Primitive settings, while increasing opportunities associated with developed facilities and roaded access. Due to this change in recreation settings, the type of user attracted to the area would shift to those desiring easily accessible recreation places. This would discourage outfitter and guide operations, which are generally dependent on undisturbed areas. Users desiring more remote settings are likely to go elsewhere. The only remaining Semi-Primitive settings within the Project Area would be those preserved in LUD II roadless areas, Mt. Calder/Mt. Holbrook and Salmon Bay. Consequently, these roadless areas would experience increased use. Some users seeking undisturbed recreation sites would be displaced to areas outside the Project Area. The loss of undisturbed areas may increase competition between tourists and residents for use of the remaining areas for recreation and subsistence. Finally, increased recreation and accompanying use of the road system could cause an increase in road maintenance and upgrades.

From 2004 to 2054 (the end of the harvest rotation) secondary growth would restore portions of the study area to a more natural-appearing, roaded setting. Depending on closure of logging roads, several Roaded Modified areas may shift to Semi-Primitive Motorized settings and possibly Semi-Primitive Nonmotorized settings. However, subsequent entries may preclude Semi-Primitive Motorized status due to maintenance of roads and continued alterations to the natural environment. Most harvested and roaded areas would require one rotation after harvest and road closure for regeneration to give the area a natural appearance. Subsequent entries may increase the attractiveness of the area for dispersed motorized recreation by providing roaded access to areas where previous harvests have returned to a natural appearance. Increased use or displacement of users depends in part on user expectations and requirements for a variety of activities. Consistent with state trends, tourism is expected to continue to increase and slowly become a greater economic factor for local communities.

By 2054, harvest of most suitable lands is expected. The forest would be a mosaic of even-aged stands, interspersed with preserved roadless areas. The areas would be extensively roaded. Tourism would generate some type of income for many residents. Private recreational developments may increase, supplying goods and services for tourists, complementing state and federal recreational developments. The development of karst/cave resources in particular, is expected to increase recreational development in the private sector to complement available activities.

Harvest units that are located in primitive, undisturbed areas and roadless areas would alter the landscape so that recreation opportunities shift to motorized use in a modified environment. Harvest units in recreation places would eliminate the use of that area until the forest regenerates. The expected rate of visual recovery for recreational interests is 40 to 50 years. The closure of a majority of the roads after harvest will aid in a return to an undisturbed setting. The shift to modified environments is consistent with the desired future condition for the Project Area, yet constitutes a decrease in the range of recreation activities available, and consequently would be an irretrievable commitment of these resources.

The decrease in Primitive and Semi-Primitive recreation settings is a consequence of implementing the Tongass Land Management Plan to achieve the desired future condition for areas within a Timber Production or Modified Landscape LUD. The desired future condition for areas designated as a LUD II or Special Interest Area is retention of the unmodified natural environment, natural diversity and scenic quality. These LUD's cover 25 percent of the Project Area. Forest Service goals for recreation state the need for a wide variety of recreation opportunities, with special attention paid to areas important for the tourist industry and for local recreational use. The proposed Project would provide greater opportunities for developed recreation. At the same time, it would decrease opportunities for recreation in remote settings. This would most significantly affect local residents and outfitter/guides who frequent present remote locations.

Use and Demand

Future recreation use and demand in the Project Area is expected to change in varying degrees with the implementation of a number of the alternatives. Existing recreation activities and pat-

terns generally are associated with a combination of natural and roaded settings. The action alternatives generally add to existing road networks.

As recreation settings change, recreationists would have several options. Users may find the conversion of some areas to roaded settings unacceptable and would either cease their activity or be displaced to other areas, such as lands within LUD II boundaries. If these areas do not meet the expectations or requirements for an undisturbed area, some users would be displaced to areas outside of the Project Area undisturbed by harvesting activities. Some recreationists would adapt to the changes in the settings and continue to pursue traditional activities in the Project Area. Others may substitute their activities with opportunities associated with the new settings. The degree of change in recreation use patterns will depend on the degree of landscape modifications associated with the chosen alternative.

Roadless Areas

By the year 2054, the only designated roadless areas remaining in the Project Area would be those within the LUD II boundaries (the Mt. Calder/Mt. Holbrook LUD II and the Salmon Bay LUD II areas.). All others would be affected by harvest activities and road construction to varying degrees, and would not meet the requirements for wilderness designation.

Monitoring

The Forest Plan recognizes three distinct types of monitoring: implementation, effectiveness, and validation. Implementation monitoring determines if projects and activities comply with Forest Plan standards and guidelines. Effectiveness monitoring determines whether the standards and guidelines achieve the desired results. Validation monitoring determines whether the assumptions in the Forest Plan regarding the relationship between management actions and their effects are correct, or if there is a better way to depict these relationships.

A monitoring plan has been developed for the Tongass National Forest by the Forest Planning Team and is described in the TLMP Draft Revision (1991a). Recommendations for Forest Plan monitoring of recreation resources in the Lab Bay Project Area have been documented in the Recreation Resource Report (Suttle 1993) and the project planning record.

Project-specific monitoring that is unique to the Lab Bay Project Area, and that would not be included in regular Forest Plan or routine implementation monitoring, has been identified for several resources. Project-specific monitoring is not identified for recreation resources in the Lab Bay Project area. Chapter 2 summarizes how project activities relate to Forest Plan and Ketchikan Area monitoring plans, and describes project-specific monitoring opportunities.

Other Environmental Considerations

Probable Adverse Environmental Effects that Cannot be Avoided

Implementation of any action alternative may result in some adverse environmental effects that cannot be effectively mitigated or avoided if the proposed action is to take place. The interdisciplinary procedure used to identify specific harvest units and roads was designed to eliminate or lessen the significant adverse consequences. In addition, the application of standards and guidelines, BMP's, mitigation measures, and a monitoring plan are intended to further limit the extent, severity, and duration of these effects. The specific environmental effects of the alternatives were discussed earlier in this chapter, and the proposed mitigation measures are described for each alternative in Chapter 2. Although the formulation of the alternatives included avoidance of potentially adverse environmental effects, some adverse impacts to the environment which cannot be completely mitigated may occur.

Although standards and guidelines, BMP's, and monitoring plans are designed to prevent significant adverse effects to soil and water, the potential for adverse impacts does exist. Sediment production would occur as long as roads are being built and timber is harvested. Sediment would be produced by surface erosion, channel erosion, and mass movement.

Disturbance, displacement, or loss of fish and wildlife may occur as a consequence of habitat loss and increased human activity in the Project Area. New road construction and the human activities associated with new access to areas previously unroaded would result in impacts to fish and wildlife. Improved access into areas that previously had limited roads would have similar effects. The proposed activities would increase competition for subsistence resources.

Ground-disturbing activities would temporarily increase sediment loads in some streams. This could displace fish, reduce anadromous and resident fish reproductive success, and alter aquatic invertebrate populations. The portion of a stream bed occupied by a culvert or other crossing structure would be lost as fish habitat.

Both the amount and distribution of mature and old-growth stands would be reduced through implementation of any action alternative. The rate and severity of adverse impacts varies by alternative. Because some wildlife species rely on habitat conditions provided by old-growth stands, reduction in the populations of some wildlife species can be expected. As old growth and mature timber stands are converted to young even-aged stands, the capability of the Project Area to provide optimal habitat for old-growth dependent species would be reduced.

Timber harvest and road construction in areas that are currently unroaded would alter natural characteristics of these areas. This would modify the recreational experiences that are offered by these areas. Both Primitive and Semi-Primitive recreational opportunities will be lost by these actions. In addition, these development activities would result in a loss of opportunity to consider these areas in future revisions of the Forest Plan, for designation as wilderness, as research natural areas, or for other purposes requiring natural characteristics.

The natural landscape would appear visually altered by timber harvest, particularly where logging activity is highly visible from travel routes. These adverse effects would eventually be reduced by growth of vegetation. Other impacts on the natural appearance of the landscape include roads and structures which are highly visible despite efforts to blend them with land forms and mitigate the effect by landscaping.

The intensity and duration of these effects depends on the alternative and the mitigation measures applied to protect the resources. Most unavoidable effects are expected to be short-term (usually less than two years). In all cases, the effects would be managed to comply with established legal limits, such as a maximum time for regeneration. To reduce these effects, monitoring procedures

and mitigation measures have been planned for those areas which may be affected. Specific mitigation measures for each alternative are included in Chapter 2.

Some adverse effects are of a transitory type. For example, air quality may diminish on a recurring, though temporary, basis due to the road construction, timber harvest, timber hauling, and recreation traffic on untreated roads, and due to the operation of internal combustion engines. Where they occur, these activities may have localized temporary adverse effects on air quality.

Relationship Between Short-term Uses and Long-term Productivity

All alternatives would come under the mandate of the Multiple Use and Sustained Yield Act of 1960, which requires the Forest Service to manage Forest System lands for multiple uses (including timber, recreation, fish and wildlife, range, and watershed). All renewable resources are to be managed in such a way that they are available for future generations. The harvesting and use of standing timber can be considered a short-term use of a renewable resource. As a renewable resource, trees can be re-established and grown again if the productivity of the land is not impaired.

Maintaining the productivity of the land is a complex, long-term objective. All alternatives protect the long-term productivity of the Project Area through the use of specific standards and guidelines, mitigative measures, and BMP's. Long-term productivity could change as a result of various management activities proposed in the alternatives. Timber management activities would have direct, indirect, and cumulative effects on the economic, social, and biological environment.

Soil and water are two key factors in ecosystem productivity, and these resources would be protected in all alternatives to avoid damage that could take many decades to rectify. Sustained yield of timber, wildlife habitat, and other renewable resources all rely on maintaining long-term soil productivity. Quality and quantity of water from the Project Area may fluctuate as a result of short-term uses, but no long-term effects to the water resource are expected to occur as a result of timber management activities.

All alternatives would provide the fish and wildlife habitat necessary to contribute to the maintenance of viable, well-distributed populations of existing native and desired nonnative vertebrate species. The abundance and diversity of wildlife species depends on the quality, quantity, and distribution of habitat, whether used for breeding, feeding, or resting. Management Indicator Species are used to represent the habitat requirements of all fish and wildlife species found in the Project Area. By managing habitats and populations of indicator species, the other species associated with the same habitat would also benefit. The alternatives provide standards, guidelines, and mitigation measures for maintaining long-term habitat and species productivity. The alternatives vary in the risk presented to both wildlife habitat and habitat capability.

Timber rotations are normally over a 100-year period. To ensure adequate production of timber, harvest has been scheduled to allow the earliest cut stands to mature into merchantable timber before the planned harvest of original stands is complete. When the first rotation is complete, mature timber stands would be harvested again on a new rotation. Management of the timber resource on these rotations could affect long-term productivity, depending on the intensity of silvicultural practices. Projected timber rotation lengths are not anticipated to affect long-term productivity. Mitigation measures are planned under all the alternatives to ensure future availability of other renewable resources as well.

Opportunities for dispersed recreation use, including hiking, camping, and fishing, would be maintained and increased for future generations. The setting in which these activities occur varies by alternative, but the long-term potential for the Project Area to provide a spectrum of recreation opportunities would be maintained in all alternatives.

Irreversible Commitments of Resources

Irreversible commitments of resources are decisions to use, modify, or otherwise affect nonrenewable resources such as cultural resources and geological/mineral resources. The term could also apply to resources renewable only over a long period of time such as soil productivity, unroaded areas, or old-growth forests. Such commitments of resources are considered irreversible because the resource has deteriorated to the point that renewal can occur only over a long period of time or at a great expense, or the resource has been destroyed or removed. All alternatives result in some irreversible commitments, although the extent and potential for adverse effects increase in alternatives which emphasize resource extraction and utilization.

The irreversible disturbance of some types of cultural resources may occur as a consequence of the action alternatives. This would be especially true for subsurface resources that cannot be located through surface surveys. Forest standards and guidelines, established survey methodology, and mitigation measures specified in this document provide reasonable assurance that there would be no irreversible loss of cultural resources. The potential loss of cultural resource sites resulting from accidental damage or vandalism is unlikely to occur under all action alternatives.

The loss of cave resources resulting from road or quarry construction and timber harvesting may result from the implementation of Alternatives 2, 4, and 5. Draft Karst and Cave Resource Management Forest-wide standards and guidelines (USDA Forest Service 1994a), established survey methodology, karst vulnerability assessment, and mitigation measures specified in this document provide reasonable assurance that there would be no irreversible loss of cave resources. The effects to cave resources are described in Geology, Minerals, and Karst Resources section of this chapter.

The construction of roads, to provide access to the Forest, is an irreversible action because of the time it takes for a constructed road to revert to natural conditions. Also irreversible are the rock quarries developed in conjunction with the roads. Alternative 1 would have no new construction of roads or quarries, while Alternatives 2-6 would construct roads and quarries to harvest units as described under the Transportation, Logging, and Facilities section of this chapter.

There are three roadless areas entirely within the Project Area and one partially within the Project Area that would be affected by the Lab Bay action alternatives. A decision to develop these roadless areas would mean that their primitive character in terms of opportunities for solitude and remoteness would be foregone. Alternative 1 would have no new roads constructed or units harvested, while Alternatives 2-6 would construct roads and harvest timber as described in the Recreation section of this chapter. Implementation of an action alternative would result in an irreversible loss of portions of these roadless areas.

The loss of old-growth habitat due to logging can be considered an irreversible effect since regenerating stands are not expected to regain old-growth characteristics for approximately 150 years. Alternative 1 would not harvest any old growth, while Alternatives 2-6 would harvest old-growth timber as described in the Wildlife, Old Growth, and Biodiversity section of this chapter.

Loss of soil due to erosion and mass failures is an irreversible commitment of resources. However, the incorporation of Best Management Practices (BMP's), Forest Plan standards and guidelines, and mitigation measures specified in this document, it is not anticipated that there would be any significant soil loss under any alternative.

Irretrievable Commitments of Resources

Irretrievable commitment of natural resources means loss of production or use of resources due to management decisions made in the alternative. This represents opportunities foregone for the period of time that the resource cannot be used.

The reduction in visual quality of an area due to timber harvesting would be an irretrievable commitment of resources. The commitment is irretrievable since viewsheds would typically heal from a visual quality standpoint after about 40 years. After this time, the second-growth trees would have the color and height needed so as not to be evident to the casual observer. Alternative 1 would have no new roads constructed or units harvested, while Alternatives 2-6 would irretrievably commit visual resources due to road construction and timber harvesting as described in the Visuals section of this chapter.

3 Environment and Effects

Possible Conflicts with Plans and Policies of Other Jurisdictions

The regulations implementing NEPA require a determination of possible conflicts between the proposed action and the objectives of Federal, State, and local land use plans and policies. The major land use regulations of concern are the CZMA, Section 810 of ANILCA, and the State of Alaska's Forest Practices Act. A discussion of each of these determinations is presented below.

Coastal Zone Management Act of 1976 (CZMA)

The CZMA was passed by Congress in 1976 and amended in 1990. This law, as amended, requires Federal agencies conducting activities or undertaking development which affect the coastal zone to ensure that the activities or developments are consistent with enforceable policies of approved State coastal management programs to the maximum extent practicable. The State of Alaska passed the Alaska Coastal Management Act in 1977 to establish a program that meets the requirements of the CZMA. It contains the standards and criteria for a determination of consistency for activities within the coastal zone.

The Forest Service has evaluated the alternatives to ensure that the activities and developments affecting the coastal zone are consistent with approved coastal management programs to the maximum extent practicable. The standards and guidelines for timber management activities in the Lab Bay Project Area meet or exceed those indicated in the Alaska Forest Practices Act and the Alaska Coastal Management Program (ACMP).

Evaluation of the proposed activities against standards and requirements for activities within the coastal zone results in a finding that these activities are consistent with the Alaska Coastal Management Program to the greatest extent practicable. In accordance with the Memorandum of Understanding and Alaska statutes, the State of Alaska Office of Governmental Coordination consistency review of the proposed action was completed. The State concluded that the proposed action is consistent with the ACMP in its letter dated May 22, 1996.

Alaska National Interest Lands Conservation Act of 1980 (ANILCA)

Under Section 810 of ANILCA, agencies are required to evaluate the effects of proposed actions on subsistence uses of Federal land and to determine if the proposed action may significantly restrict subsistence opportunities. Refer to the Subsistence section of this chapter for the evaluation of impacts to subsistence use as a result of the alternatives.

State of Alaska's Forest Practices Act of 1990

On May 11, 1990, Governor Cowper approved the legislature's major revision of the State's Forest Practices Act. The revised act significantly increases the State's role in providing protection and management for important forest resources on State and private lands. The revised Forest Practices Act will also affect National Forest management through its relationship to the ACMP and the Federal CZMA (see above discussion).

For National Forest timber operations such as proposed for the Lab Bay Project, the effect of the revised Forest Practices Act is essentially two-fold. First, it clarifies that the revised Forest Practices Act is the standard which must be used for evaluating timber harvest activities on Federal lands for purposes of determining consistency, to the maximum extent practicable, with the Alaska Coastal Zone Management Program. Secondly, it calls for minimum 100-foot buffers on all Class I streams. Compliance with the Alaska Coastal Management Program is attainable in Federal timber harvest activities, using specific methodologies that may differ from those required by the revised Forest Practices Act or its implementing regulations.

The Forest Service has evaluated the alternatives to ensure that the activities and developments affecting the coastal zone are consistent with approved coastal management programs to the maximum extent practicable. The design of all proposed harvest units will comply with the TTRA requirements for stream buffers which exceed the stream buffer requirements in the Forest Practices Act.

Energy Requirements and Conservation Potential

The implementation of an action alternative would require the expenditure of energy (e.g., fuel consumption). The amount of energy used varies by alternative based on timber volume harvested and miles of road constructed. The direct effect of the alternatives on energy requirements would be attributed to timber harvest, road construction, and travel necessary to administer the timber sale. Indirect energy requirements include processing wood products and the transport of the products to secondary processors and consumers. The estimated total fuel consumption required for each alternative is displayed in Table 3-165 and is based on the following assumptions:

1. The rate for timber sale preparation and administration is 0.5 gallon per thousand board feet.
2. The rate for highlead logging is 2 gallons per thousand board feet.
3. The rate for loading and hauling by truck and for water transport is 8 gallons per thousand board feet.
4. The rate for road construction is 4,000 gallons per mile.
5. The rate for road maintenance is 20 gallons per mile.
6. For the helicopter units, a Bell 214B helicopter would use 160 gallons per hour and would yard 20,000 board feet per hour (8 gallons per thousand board feet).

Table 3-165

Estimated Fuel Consumption by Alternative

Fuel Consumption	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Thousands of gallons	0	1,486.8	949.6	946.2	1,024.4	580.3
Average gallons/MBF	0	14.5	14.8	14.9	14.6	14.5

Source: Lab Bay Planning Record

Natural or Depletable Resource Requirements and Conservation Potential

Conservation Potential

To conserve fuel and/or minimize harvesting costs, the Forest Service has undertaken studies and allowed experimentation on the use of new harvesting equipment and techniques. Shovel yarding is estimated to use 2.7 gallons of fuel per thousand board feet, which is almost a gallon more than for conventional cable yarding; however, savings are realized in labor cost. Labor cost per thousand board feet is based on a crew size of 1-2 people for shovel yarding compared to an average of 4 people for cable yarding.

The use of low tire pressure equipment (central tire inflation) during road construction and logging has shown to decrease costs during studies nationwide and on the Stikine Area of the Tongass National Forest. Studies on Mitkof Island indicate that 10 to 14 percent less rock was needed during road construction, resulting in a cost savings of approximately $450,000. It is predicted that costs for rock replacement/road maintenance, log truck fuel, and tire repair and replacement, will be decreased. Cost savings have proven to be substantial enough that the Forest Service provides a contract clause allowing a reduction in rock replacement deposits when low tire pressure equipment is used.

The use of cable yarding equipment fitted with mechanical or hydraulic interlocks, provides the ability to decrease yarding expense as the throttle and brake do not have to be operated simultaneously to provide deflection for the turn of logs.

3 Environment and Effects

All alternatives considered in detail are designed to conform to applicable laws and regulations pertaining to natural or depletable resources, including minerals and energy resources. Regulation of mineral and energy activities on the National Forest, under the U.S. Mining Laws Act of 1872 and the Mineral Leasing Act of February 1920, is shared with the Bureau of Land Management (BLM). The demand for access to National Forest system lands for the purpose of mineral and energy exploration and development is expected to increase over time.

The action alternatives propose road construction that would increase opportunities for access to the National Forest within the Lab Bay Project Area. This increased access may result in increased activity with regard to potential mineral or energy resource development.

The Geology, Minerals, and Karst Resources section of this document describes the existing mining claims within the Project Area and the potential for mineral development.

Urban Quality, Historic and Cultural Resources, and the Design of the Built Environment

The Lab Bay Project Area contains no urban areas of any kind. Therefore, the only applicable concern is with historic and cultural resources. The goal of the Forest Service's Cultural Resource Management Program is to preserve significant cultural resources in their field setting and ensure they remain available in the future for research, social/cultural purposes, recreation, and education. The direct, indirect, and cumulative effects of the alternatives on cultural resources have been evaluated. The result of this evaluation is the determination that there are adequate standards, guidelines, and procedures to protect cultural resources and to meet the goals of the Cultural Resources Management Program. Cultural resources and the proposed project design are discussed further in the Cultural Resources section of this chapter.

Effects on Consumers, Civil Rights, Minorities, and Women

All Forest Service actions have the potential to produce some form of impact, positive and/or negative, on consumers. The effects of the alternatives on consumers is reflected in the Socio-economic section. This includes a discussion of the various goods and services supplied as a result of the proposed action.

The need to conduct an analysis of the potential impact on civil rights, minority groups, and women is required by Forest Service NEPA Manual and Handbook direction. The potential effect of these alternatives as they apply to tribal interests are addressed in the Cultural Resources and Subsistence sections of this document. Other effects could occur within the context of timber sale contracting and is beyond the scope of this analysis.

Effects on Prime Farm Land, Rangeland, and Forestland

All alternatives are in keeping with the intent of Secretary of Agriculture Memorandum 1827 for prime land. The Project Area does not contain any prime farm lands or rangelands. Prime forestland does not apply to lands within the National Forest System. In all alternatives, lands administered by the Forest Service would be managed with a sensitivity to the effects on adjacent lands.

Effects on Threatened and Endangered Species, and Critical Habitat

There would be no adverse impacts to any Federally listed threatened and endangered species or critical habitat as a result of this project. The humpback whale and the Steller sea lion are the two known threatened and endangered species that inhabit the marine waters surrounding the Project Area. The discussion of the effects of the alternatives on threatened and endangered species is presented in the Threatened, Endangered, and Sensitive Species section of this chapter.

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Glossary

Acronyms

ACMP	Alaska Coastal Management Program
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
AHMU	Aquatic Habitat Management Unit
ANCSA	Alaska Native Claims Settlement Act of 1971
ANILCA	Alaska National Interest Lands Conservation Act of 1980
ASQ	Allowable Sale Quantity
ATTF	Alaska Timber Task Force
ATV	All-terrain Vehicle
BA/BE	Biological Assessment/Biological Evaluation
BLM	Bureau of Land Management
BMP	Best Management Practice
CFL	Commercial Forest Land
CFR	Code of Federal Regulations
CMT	Culturally Modified Tree
COE	Army Corps of Engineers
CZMA	Coastal Zone Management Act of 1976
DBH	Diameter at Breast Height
DEIS	Draft Lab Bay Environmental Impact Statement
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EVC	Existing/Expected Visual Condition
FEIS	Final Lab Bay Environmental Impact Statement
FPA	Forest Practices Act
FSH	Forest Service Handbook
FTE	Full-time Equivalent
GIS	Geographic Information System
GMU	Game Management Unit
HCA	Habitat Conservation Area
HCM	Habitat Capability Model
HGC	High Gradient Contained Channel Type
IDT	Interdisciplinary Team
KPC	Ketchikan Pulp Company
KV	Knutsen-Vandenberg Act
LOA	Letter of Agreement
LTF	Log Transfer Facility
LSTA	Logging System and Transportation Analysis
LUD	Land Use Designation
LWD	Large Woody Debris
M	Thousand
M (VQO)	Modification
MA	Management Area
MBF	One thousand board feet
MIS	Management Indicator Species

MM	Million
MM (VQO)	Maximum Modification
MMBF	One million board feet
MMI	Mass Movement Index
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act of 1969 (as amended)
NFMA	National forest Management Act
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Unit
ORV	Off Road Vehicle
P	Preservation
PR	Partial Retention
PRIM	Primitive
R	Retention
RM	Roaded Modified
RMA	Riparian Management Area
RMO	Road Management Objective
RN	Roaded Natural
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
RVD	Recreation Visitor Day
SHPO	State Historic Preservation Officer
SPM	Semi-Primitive Motorized
SPNM	Semi-Primitive Non-Motorized
TDS	Total Dissolved Solids
TIS	Transportation Inventory System
TLMP	Tongass Land Management Plan
TRUCS	Tongass Resource Use Cooperative Survey
TTRA	Tongass Timber Reform Act
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USFWS	United States Fish and Wildlife Service
VCU	Value Comparison Unit
VQO	Visual Quality Objective
WAA	Wildlife Analysis Area

Terms Used in Text

A.H.R.S. - Alaska Heritage Resource Survey, a database housed at the Office of History and Archaeology, Alaska Division of Parks, Department of Natural Resources.

Access Management - Acquiring rights and developing and maintaining facilities needed by people to get to and move through public lands.

Adfluvial - Fish that ascend or descend from freshwater lakes to breed in streams; includes trout, char and kokanee.

Adjacency Requirements - A Forest Plan standard that restricts the placement and sizing of new harvest units immediately next to previously harvested units until the previously harvested area has achieved the desired height growth necessary to meet resource objectives of the area.

Adopted VQO - The VQO to be achieved as a result of management direction identified in the approved Forest Plan. Adopted VQO's represent the visual resource objective for the Forest Land Management Plan period.

Preservation - Management activities are generally not allowed in this setting. The landscape is allowed to evolve naturally.

Retention - Management activities are not evident to the casual Forest visitor.

Partial Retention - Management activities may be evident, but are subordinate to the characteristic landscape.

Modification - Management activities may dominate the characteristic landscape but will, at the same time, use naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed as middleground (1/4 to 5 miles from viewer).

Maximum Modification - Management activities may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.

Advanced Regeneration - Natural conifer reproduction established beneath an existing forest canopy; comprised of trees ranging from 5-20 feet in height.

Alaska National Interest Lands Conservation Act (ANILCA) - Federal law passed in 1980 which requires evaluations of subsistence impacts before changing the use of certain Federal lands.

Alaska Native Claims Settlement Act (ANCSA) - Provides for the settlement of certain land claims of Alaska natives.

Alevin - Newly hatched salmon that are still attached to the yolk sac.

Allowable Sale Quantity (ASQ) - The maximum quantity of timber that may be sold in each decade from suitable scheduled lands covered by the Forest Plan.

Alluvial Fan Channel - A fan-shaped deposit of sand, gravel, and fine materials made by a stream where it runs out onto a level plain or meets a slower stream.

Ambient Air - Air encompassing or surrounding a specific region.

Ambient Air Quality Standard - The prescribed level of pollutants in the outside air that cannot be exceeded legally during a specified time in a specified geographical area.

Anadromous - Fish that ascend from the sea to breed in freshwater streams; includes salmon and trout.

Aquatic Habitat Management Unit (AHMU) - Areas for managing the resources associated with streams and lakes.

Arterial Roads - Roads usually developed and operated for long-term land and resource management purposes and constant service.

B.P. - Before Present, defined as radiocarbon years before 1950.

Basal Area (BA) - The area of the cross section of a tree stem, or group of trees, measured at 4.5 feet above ground; usually presented as total square feet per acre.

Bedload - Sand, gravel, or soil and rock debris rolled along the bottom of a stream by the moving water.

Best Management Practices (BMP's) - Land management methods, measures or practices intended to minimize or reduce water pollution. Usually BMP's are applied as a system of practices rather than a single practice. BMP's are selected on the basis of site-specific conditions that reflect natural background conditions and political, social, economic, and technical feasibility.

Biological Diversity - The diversity of life in all its forms and all its level of organization characterized by elements including composition, function, and genetic variability.

Blind Lead - An area within a harvest unit that is difficult to yard (remove felled timber) with conventional cable logging systems on convex slopes.

Board Foot (BF) - A unit of timber measurement equalling the amount of wood contained in an unfinished board 1 inch thick, 12 inches long and 12 inches wide. One MBF = 1,000 board feet.

Cable Yarding - The use of steel towers and wire rope to move logs from the stump to the landing.

Casual Forest Visitor - One who temporarily inhabits the Forest and typically engages in recreational pursuits. This visitor has a conscious or subconscious interest in scenic quality.

Category 2 Candidate - A species or group of species being considered by the U.S. Fish and Wildlife for listing as endangered or threatened, but for which conclusive data is lacking on its biological vulnerability and degree of threat. Currently called Species of Concern.

Cave - Any naturally occurring void, cavity, recess, or system of interconnected passages which occurs beneath the surface of the earth or within a cliff or ledge and which is large enough to permit an individual to enter.

Cave Resources - Any material or substance occurring in caves such as animal life, plant life, paleontological resources, cultural resources, sediments, minerals, speleogens, and speleothems.

Cavity Excavator - An animal that constructs cavities in trees for nesting or roosting.

Channel Types - The defining of stream sections based on watershed runoff, landform relief, and geology.

Class II Airshed - The second of three area classes in the Clean Air Act (Class I areas are the "cleanest"). Class II Airsheds have no specific criteria that must be met to attain and maintain ambient air quality standards.

Clearcut - Harvesting method in which all trees are cleared in one cut. It prepares the area for a new even-aged stand.

Climax Plant Community - The final or stable biotic community in a successional series which is self-perpetuating and in dynamic equilibrium with the physical habitat; the assumed end point in succession.

CMT's - Culturally Modified Trees are trees which 1) have had bark removed for use in basketry or other items, or to get at the edible cambium layer, or 2) have been deeply notched to hold bait and traps for pine martens. According to Forest Service guidelines, CMT's are not recorded as cultural resource sites unless a large number are found in a limited area.

Collector Roads - Collect traffic from Forest Local roads; usually connect to a Forest Arterial road or public highway.

Commercial Forest Land (CFL) -Land that is capable of producing continuous crops of timber that has not been withdrawn from timber production (20 cubic feet of tree growth annually, or at least 8 MBF/acre).

Cover - Vegetation used by wildlife for protection from predators, or from adverse weather conditions, or in which to reproduce. The different types are identified as hiding cover, thermal cover, and security areas.

Cultural Resources - Evidence of past human-related activity, dating from the earliest occupation of the area to as recent as 50 years ago. Cultural resources which Forest Service guidelines direct to be formally recorded and evaluated are sites such as shell middens, fish traps, villages, mines, and canneries.

Cumulative Visual Disturbance (CVD) - The amount of disturbance visible to the casual forest visitor at any one point in time. As determined in planimetric view and applied by the Forest Service, CVD suggests the percentage of a viewshed to be in a disturbed condition at any one point in time.

Debris Avalanche - The sudden movement downslope of the soil mantle; occurs on steep slopes and is often triggered by the complete saturation of the soil from prolonged heavy rains.

Debris Torrent - Landslides that occur as a result of debris; avalanche materials which either dam a channel temporarily or accumulate behind temporary obstructions such as logs and forest debris. Debris torrents are usually confined within the stream channel until they reach the valley floor, where the debris spreads out, inundating vegetation and forming a broad surface deposit.

Direct Effects for Employment and Income - Those effects that impact sectors either exporting goods and services from the primary zone of influence or selling those products to final consumers within the zone. An example of direct employment would be people working in a sawmill.

Discharge - The volume of water moving through a stream channel over a given time period.

Discounted Benefits - The sum of the stream of all benefits derived from the Forest over the life of a project, discounted to the present.

Discounted Costs - The sum of the stream of all costs derived from the Forest over the life of a project, discounted to the present.

Distance Zone - Areas of landscapes denoted by specified distances from the observer (Foreground: 0 to 1/4-1/2 mile, Middleground: 1/4-1/2 to 3-5 miles, or Background: greater than 3-5 miles). Used as a frame of reference in which to discuss landscape characteristics and management activities.

Doline or Sinkhole - Bowl- or funnel-shaped depressions ranging in diameter from a few to more than 3,000 feet, and from about 10 to 300 feet in depth. Sinkholes originate primarily either by solution from the surface downward or by collapse in solution cavities at depth.

Draft Interim-designated HCA's - Proposed Habitat Conservation Areas identified in the Interim Habitat Management Guidelines for Maintaining Well-distributed Viable Wildlife Populations within the Tongass National Forest, Draft Environmental Assessment (1994a).

Economic Efficiency - A measure of the relationship between discounted costs and discounted benefits, such as present net value or benefit/cost ratio.

Ecosystem - All of the organisms in a given area interacting with the physical environment so that the flow of energy leads to an exchange of materials between living and nonliving parts within the system.

Edge - Where plant communities meet or where successional stage or vegetation conditions within the plant community come together.

Encumbrance - A claim, lien, charge, or liability attached to and binding real property.

Endangered - A species in danger of extinction throughout all or a significant portion of its range.

Epikarst - The upper surface of the karst, including the upper percolation zone through which surface waters enter the karst hydrologic system and in which most dissolution of the carbonate takes place.

Estuarine - Deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land, have open, partly obstructed or sporadic assess to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land.

Ethnography - The descriptive study of aspects of human cultural adaptations.

Eulachon - Oolican or candlefish, a species of smelt caught during spring runs in large streams, estuaries or bays. The fish was and is an important source of oil for native human populations.

Even-Aged Management - The application of a combination of actions that result in the creation of stands in which trees of essentially the same age and height grow together. The age difference between trees in the canopy level usually does not exceed 20 percent.

Existing Visual Condition (EVC) - The level of visual quality or condition presently occurring on the ground.

Falldown - The difference between planned or scheduled harvest and that which is attained after implementation.

Fines - Soil particles less than 2 mm in diameter, usually transported as suspended load in a stream.

Floodplain - That portion of a river valley, adjacent to the river channel, which is covered with water when the river overflows its banks at flood stages.

Fluvial Process Group - A group of similar stream channel types.

Forage - All browse and nonwoody plants that are available to domestic livestock or game animals and used for grazing or harvested for feeding.

Forest-wide Standards and Guidelines - These are the standards and guidelines that apply to all, or most, areas of the Forest. Each management prescription includes a list of those that apply to that land use designation.

Forestland - Land at least 10 percent occupied by forest trees of any size, or formerly having had such tree cover and not currently developed for nonforest use.

Fragmentation - A process which results in a small unit of land with its various plants and animals which has become separated from either, similar ecosystems by the intrusion of a barrier, either water or open land.

Future Visual Condition (FVC) - The level of visual quality or condition occurring on the ground at the end of the proposed harvest period.

Game Management Unit (GMU) - A geographical division of land designated by the Alaska Department of Fish and Game for game management and regulatory purposes. There are a total of 26 such units in the state of Alaska.

GIS - Geographic Information System.

Glide Channel - Channel types that occur on lowlands and landforms, and are mostly associated with bogs, marshes, or lakes.

Grike - Solution-widened joints, faults, and/or bedding contacts in a karst area.

Group Selection - A harvesting method in which trees are removed in small groups.

Habitat - The sum total of environmental conditions of a specific place occupied by a wildlife species or a population of such species.

Habitat Capability (HC) - The long-term potential of an area to support animals.

Habitat Capability Model (HCM) - Mathematical models which estimate habitat capability for a species. The models do not predict actual populations.

High Quality Habitat - Habitat suitability index (HSI) greater than or equal to 0.5.

Implementation Monitoring - Collecting information to evaluate whether mitigation measures were carried out in the required manner.

Induced Effects for Employment and Income - The effects that are linked through the direct and indirect effects income that consumers spending within the area. An example of induced employment would be grocery store employees who sell products to the people working in sawmills or generating plants.

Insurgence - Point at which a stream flows into the ground.

Karst - A type of topography that develops in areas underlain by soluble rocks, primarily limestones. Dolines, collapsed channels, vertical shafts, and caves are formed when the subsurface layer dissolves. Areas on which karst has developed are said to display "karst topography" or are referred to as a "karst landscape".

Karst Landscape - An ecological unit found atop carbonate bedrock in which karst has developed, and including the recharge areas on adjacent noncarbonate substrate. A few of the characteristics of this ecological unit include: mature, well-developed spruce and hemlock forests; increased productivity for plant and animal communities; extremely productive aquatic communities; well-developed subsurface drainage; and underlying unique cave resources.

Karstlands - The areas found atop carbonate rock within which karst has developed, and including the watersheds that contribute surface flow to karst.

Lacustrine Sediments - Fine sediment (generally silt and clay) deposited in an ancient lake bed.

Lacustrine Wetland - Includes permanently flooded lakes and reservoirs, intermittent lakes, and tidal lakes with ocean-derived salinities of less than 0.5 percent. Typically, there are extensive areas of deep water and there is considerable wave action.

Land Use Designation (LUD) - The method of classifying land uses presented in the Forest Plan (Tongass Land Management Plan [TLMP 1979, as amended]).

Landing - Initial location where the logs are placed upon removal from the woods. With cable systems, the yarder operates on the landing.

Large Woody Debris (LWD) - Any large piece of relatively stable woody material having a diameter of at least 10 centimeters and a length greater than one meter that intrudes into a stream channel; also called Large Organic Debris (LOD).

Local Roads - Provide access for a specific resource use such as a timber sale or recreational site; other minor uses may be served.

Log Transfer Facility (LTF) - A facility that is used for transferring commercially harvested logs to and from a vessel or log raft, or the formation of a log raft.

Logging Settings - A setting generally refers to the area where logs are being delivered to one landing, whether by cable, wheeled or tracked equipment. There are times when a setting may have more than one landing, such as a continuous landing along a road for shovel or swing yarding. The setting is the smallest planning unit that can be dealt with.

LSTA - Logging System and Transportation Analysis - Interdisciplinary design and mapping of all potential timber harvest units, including associated logging and transportation systems.

Management Area (MA) - An area one or more Value Comparison Unit (VCU) in size for which management direction was provided in the Tongass Land Management Plan.

Management Indicator Species (MIS) - A species selected because its welfare is presumed to be an indicator of the welfare of other species sharing similar habitat requirements.

Marine Benthic Environment - Organisms and substrate found on the bottom in saltwater habitats.

Mass Movement Index (MMI) - Rating used to group soil map units that have similar properties with respect to the stability of natural slopes.

Mass Movement/Wasting - General term for a variety of processes by which large masses of earth material are moved by gravity either slowly or quickly from one place to another.

MBF - Thousand board feet.

Midden - A pile or mound of cultural material (shell, bone, stone, charcoal, or wood) usually resulting from human habitation in one area for an extended period of time.

Mitigation - Measures designed to avoid, minimize, rectify or lessen environmental impacts.

MMBF - Million board feet, or about 220 conventional highway logtruck loads of logs.

Muskeg (peatlands) - A type of bog that has developed in depressions, or flat areas, poorly drained, acidic, with organic soils that support vegetation that is predominantly sphagnum mosses and heaths.

Mycorrhizae - Fungi with a symbiotic relationship with the roots of certain plants.

Native Selection - Application by Native corporations to the Bureau of Land Management for conveyance of a portion of lands withdrawn under ANCSA in fulfillment of Native entitlements established under ANCSA.

Nephelometric Turbidity Units (NTU) - A unit of measure for turbidity, related to the light-inhibiting properties of a fluid.

Nonrural - Generally a community with more than 7,000 people; doesn't qualify for priority use of subsistence resources.

Offering - A Forest Service specification of timber harvest units, subdivisions, roads, and other facilities and operations to meet the requirements of a timber sale contract.

Old-Growth Habitat - Defined as Volume Class 4 - 7 (>8,000 mbf/acre) and characterized as stands of trees well past the age of maturity (greater than 150 years of age), with declining growth rates and signs of decadence such as dead and dying trees, snags, and downed woody material.

Operability Classes - Logging operations are categorized as Difficult, Isolated, or Normal.

Difficult - Skyline logging systems with spans greater than 2,000 feet and helicopter logging with yarding distances less than 4,500 feet.

Isolated - Helicopter logging with yarding distances greater than 4,500 feet and conventional logging units with a low volume of timber per mile of road necessary for access.

Normal - Shovel, high lead and skyline logging systems with spans less than 2,000 feet.

Paleontological - The remains of animals that may or may not be fossilized, but are recovered in deposits not resulting from human activity.

Palustrine Wetland - Pertaining to swamps or marshes and to material deposited in a swamp environment.

Partial Cut - Any cutting other than a clearcut. This may include thinning, selection, shelterwood, or an overstory removal.

Perspective View - The landscape as seen by an observer from a viewpoint; measurements are three-dimensional (height, width, and depth).

PET - An abbreviation for the Petersburg 1:250,000 quadrangle and part of the designation assigned to each archaeological or historic site located within that quadrangle.

Petroglyphs - Carvings or incised designs on rock.

Planimetric View - The landscape as seen from above; measurements are two-dimensional (length and width).

Plant Association - A basic unit of vegetation classification based on land management potential, species composition, successional patterns, and the climax plant community.

Potlatch - Describes a ceremonial feast held among the Northwest Coast Indian Tribes and during which the host distributes gifts, a gesture requiring reciprocation.

Precommercial Thinning - The practice of removing some trees of sapling size to reduce stocking and improve tree growing space. Trees will grow faster due to reduced competition for nutrients, water, and sunlight.

Present Net Value - The difference between the discounted benefits and discounted costs.

Primary Sale Area (PSA) - The "Sale Area" designated in the KPC Long-Term Timber Sale contract is comprised of portions of Allotments E, F, and G. The Sale Area is often termed the "Primary Sale Area" (PSA). The remainder of Allotments E, F, and G are often termed the "Contingency Area" for the Contract. Allotments E. F, and G approximately correlate to the Ketchikan Administrative Area of the Tongass National Forest.

Primary Zone of Influence - The area where social, economic, and/or environmental conditions are significantly affected by change in forest resource production or management (Ketchikan and Prince of Wales Island, Alaska).

Project-defined COGA's & Corridors - Contiguous old-growth areas and wildlife travel corridors identified by Project biologists using site-specific information.

Public Net Benefits - A measurement of economic efficiency. PNB are the sum of present net value and nonpriced commodities (such as scenic quality and community stability).

Record of Decision (ROD) and Contingency Area - A document, based on information disclosed in the Final EIS, which identifies the alternative chosen, mitigation and monitoring measures to be implemented, and other information relative to the decision. The Lab Bay ROD will be issued by the Ketchikan Area Forest Supervisor.

Recreation Opportunity Spectrum (ROS) - A recreation classification system which uses established criteria to delineate land areas that identify a variety of recreation experience opportunities. Six ROS classes are used to categorize areas (see classes below).

Primitive - An unmodified environment of fairly large size. Interactions between users are very low, and evidence of other users is minimal. The area is essentially free from evidence of human-induced restrictions and controls. Motorized use is not present except for infrequent boats and planes.

Semi-Primitive Nonmotorized - A natural or natural-appearing environment of moderate to large size. Concentrations of users is low, but there is often evidence of other users. No roads are present in the area.

Semi-Primitive Motorized - A natural or natural-appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. Local roads used for other resource management activities may be present, or along saltwater shorelines there may be extensive motorized boat traffic.

Roaded Natural - Resource modification and utilization are evident, in a predominately natural-appearing environment. Interaction between users may be moderate to high, with evidence of other users prevalent. Motorized use is allowed.

Roaded Modified - Vegetative and landform alterations typically dominate the landscape. Recreation structures and facilities may be present, and off-highway vehicle use is allowed. Recreation users will likely encounter timber management activities.

Rural - The natural environment substantially modified by land use activities. High user interaction is expected. Recreation facilities designed for group use are compatible.

Recreation Place - Identified geographical areas having one or more physical characteristics that are particularly attractive to people engaging in recreation activities (e.g. beaches, trails, cabins, campgrounds).

Recreation Site - Specific locations where recreation activities take place; for example, scenic overlooks or anchorages.

Resurgence - Point at which an underground stream reaches the surface and begins flowing above ground.

Retained Structure - Merchantable or submerchantable trees and snags that are left within the harvest unit to provide biological habitat components over the next management cycle.

Riparian Area - The area including a stream channel, lake or estuary bed, the water itself, and the plants that grow in the water and on the land next to the water.

Riparian Habitat - Areas of land that are directly affected by water, usually having visible vegetation or physical characteristics reflecting this water influence. Streamsides, lake edges, or marshes are typical riparian areas.

Riparian Management Area (RMA) - The area including water, land and plants that is at least 100 slope feet away from each side of perennial streams, lakes and other bodies of water, as defined in the Stream and Lake Protection LUD.

Riverine Wetland - A category in wetland classification which includes all wetlands and deepwater habitats contained within a channel, with two exceptions: (1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and (2) habitats with water containing ocean-derived salts in excess of 0.5 percent.

Runnels - Solution channels carved by water into bedrock, either on flat or inclined surfaces.

Rural - All Southeast Alaska communities except Juneau and Ketchikan. Residents qualify for priority use of subsistence resources under ANILCA.

Salmonid - Refers to the group of fishes to which salmon belong.

Scoping Process - Activities used to determine the scope and significance of a proposed action, what level of analysis is required, what data are needed, and what level of public participation is appropriate.

Sediment - Solid material, in suspension or transported by water, gravity, ice, or air.

Sensitive - Species (identified by the regional Forester) whose population viability is of concern on national forests within the region, and which may need special management to prevent their being placed on State or Federal threatened and endangered species lists.

Sensitivity Level - The measure of people's concern for scenic quality. Three levels are assigned, based on the Forest Service Visual Management System methodology (National Forest Landscape Management, Vol. 2, Ch. 1).

Sensitivity Zone - Classification of landforms according to their probability for containing cultural resources. "High" probability areas for cultural resources in the Ketchikan Area are considered to be lands less than 100 feet above mean sea level (amsl) and along shores or adjacent to lakes and anadromous fish streams within the first 100 feet of elevation. "Low" probability areas are any lands with greater than 35 percent slope regardless of elevation, all muskeg areas, and all lands above 100 feet amsl. Recently, cultural resources have been documented in areas not totally factored into the predictive model, but currently considered as having a high probability of containing cultural resources. These areas include karst topography, natural pass areas, known historic mining areas, and traditional/ religious properties, all of which can occur at any elevation.

Shade Tolerance - Plant species physiological growth adaptation to shade conditions. Shade tolerant species such as western hemlock are able to live in shaded conditions whereas shade intolerant species such as spruce are not adapted to shaded conditions.

Silvical Characteristics - Physiological and genetic characteristics of individual tree species and the ecological characteristics (biological and environmental factors) of the site in which enable specific species to be adapted to a particular and unique site.

Silvicultural Practices - Management techniques used to modify, manage and replace a forest over time. Silvicultural practices are classified according to the method of carrying out the process (shelterwood, seed tree, clearcut, commercial thinning, etc.).

Silviculture - The art, science, and practice of controlling the establishment, composition, structure, and growth of trees and other vegetation in forest stands.

Site Index - A measure of a forest areas relative productive capacity for tree growth. Measurement of site index is based on height of dominant trees in a stand at a given age.

Skarn - A term generally reserved for rocks composed mostly of lime-bearing silicates, derived from nearly pure limestones into which large amounts of silicon, aluminum, iron, and magnesium have been introduced.

Soil Mapping Unit (SMU) -An area of relatively uniform soil and geomorphic characteristics.

Soil Productivity - Capacity of a soil to produce plant growth, due to the soil's inherent chemical, physical, and biological properties.

Special Use Permits - Permits and granting of easements (excluding road permits and highway easements) authorizing the occupancy and use of land.

Speleogen - Relief features on the walls, ceiling and floor of any cave or lava tube which are part of the surrounding bedrock.

Speleothem - Any natural mineral formation or deposit occurring in a cave or lava tube, including but not limited to any stalactite, stalagmite, cave flower, flowstone, concretion, or formation of clay or mud.

State Selection - Application by Alaska Department of Natural Resources to the Bureau of Land Management for conveyance of a portion of the 400,000-acre state entitlement from vacant and unappropriated National Forest System lands in Alaska, under the Alaska Statehood Act.

Subsistence - Customary and traditional uses by rural Alaskans of wild renewable resources.

Succession - A series of dynamic changes by which one group of organisms succeeds another through stages leading to a potential natural community or climax. The process of plant community development after disturbance involves changes in species composition over time.

Suitable Forestland - Commercial forestland identified as having the biological capability to sustain long-term timber production and administratively designated for such production.

Temporary Roads - Short-term roads built for limited resource activity or other project needs.

Threatened - A species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Till - Gravel, boulders, sand, and finer materials transported and deposited by a glacier.

Tongass Land Management Plan (TLMP) - The 10-year land allocation plan for the Tongass National Forest, also known as the Forest Plan. The TLMP was completed in 1979, amended in 1986 and again in 1991 (TLMP 1979, as amended). The TLMP currently is undergoing revision; the Draft Environmental Impact Statement (EIS) for the Proposed Revised Forest Plan was issued in 1990; a Supplement to the TLMP Revision Draft EIS was issued in 1991 (TLMP Draft Revision 1991a). Reference in the Lab Bay EIS to the TLMP Draft Revision (1991a) is to the Draft EIS as proposed to be implemented in Alternative P of the Supplement, unless otherwise noted. A new Draft Revision to the Forest Plan was released in April 1996 (1996 TLMP Draft Revision). Until a Draft Revision is approved, the TLMP (1979, as amended) remains in effect.

Tongass Resource Use Cooperative Study (TRUCS) - Research program documenting subsistence harvest and land use patterns in 30 Southeast Alaska communities conducted in 1988, directed by the University of Alaska's Institute of Social and Economic Research and carried out as a joint effort by the USDA Forest Service and the Division of Subsistence of the Alaska Department of Fish and Game.

Travel Corridor - A belt or band of cover or habitat which allows animals to move from one location to another.

Turbidity - An expression of the optical property that causes light to be scattered and absorbed rather than transmitted in straight lines through a water sample; turbidity in water is caused by the presence of suspended matter such as clay, silt, finely divided organic and inorganic matter, plankton, and other microscopic organisms.

Uneven-Aged Management - The application of management techniques which will maintain high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes. Cutting methods that develop and maintain uneven-aged stands are single-tree and group selection.

V-Notch - A shallow to deeply cut stream drainage, generally in steep, mountainous terrain; would look like a "V" from a frontal view.

Value Comparison Unit (VCU) - Areas that generally encompass a drainage basin to provide a common set of areas where resource inventories could be conducted and resource interpretations made.

Variety Class - Distinguishes areas of high importance from those of lesser importance, based on scenic quality, as defined in the Forest Service Visual Management System.

Viability - Capability of a plant or animal population to exist over the long term.

Viable Population - A population which has adequate numbers and dispersion of reproductive individuals to ensure the continued existence of the species population in the planning area.

Viewshed - The seen, or viewed, area from one or more viewpoints as defined by multiple viewframes; as seen from road, marine waterway, or specific viewpoint.

Visual Absorption Capability (VAC) - An estimate of the relative ability of a landscape to absorb management activities.

Visual Quality Objective (VQO) - A measurable standard reflecting five different degrees of acceptable landscape alteration.

Volume Class - Classification system used to differentiate timber stands into similar average volume per acre categories or strata.

Watershed - Area that contributes runoff water to a waterway.

Wetlands - Areas that are inundated by surface or groundwater with a frequency sufficient to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include muskegs, marshes, bogs, wet meadows, river overflows, mud flats, and natural ponds.

Wildlife Analysis Area (WAA) - A division of land designated by Alaska Department of Fish and Game and used by the Forest Service for wildlife analysis. WAA boundaries are generally based on watersheds.

Yarding - Process of moving logs to a landing.

Distribution List

Individuals Sent Complete Copies of Final EIS

Adams, Farrel
Aho, Richard S.
Anderson, Annette
Andrew, Richard D.
Anglin, Greg
Athorp, Fred
Bailey, Harold
Ballard, Ernesta
Baskett, Billie & Antone
Bass, Fred
Baumgartner, Bill
Begalka, Walt
Belk, Barney
Bennett, Fred P.
Berkey, David M.
Betzina, Sue
Bigelow, L.
Blubaum, John E.
Botello, Litzi
Burdett, Betsey
Cebula, Jacob
Chapman, Ray and Pat
Chatham, Jo
Christian, Mona
Clark, Larry
Coats, Gary
Confer, Cindi
Connelly, Steve
Dale, Torleif M.
Davidson, Wes
Davis, Vicki
DeMars, Janet
Dotson, Robert L.
Ducket, Kenneth
Edwards, Vern
Erickson, Richard L.
Escoffon, Michael
Faast, David
Farley, Donna
Figueroa, Pete
Finney, D.L.
Fisher, Wilbur E.
Fitzgerald, Tim and Kelli
Flynn, Kurt
Freedman, Barny
Fritzke, Mark
Funk, Kent
Garrett, Blain A.
George, Robert
Gildersleeve, Colleen
Graham, Owen
Gregg, Douglass
Gregory, Ralph
Griffin, Frank J.
Hammons, Ken
Harding, Bruce
Harrigen, E.J.
Henderson, Dale
Hernandez, Donald
Hillis, Sharon
Howell, Karen & Lance
Hursey, Scott
Hutchins, Mike
Isley, Elzie
Jankowski, Benny
Javorsky, Dave and Dollie
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Johnson, John E.
Johnson, Ruth
Jones, Floyd
Jones, Will
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Kensinger, David
Knight, Rebecca
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Kushnick, Matilda K.
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Lewis, Steve
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Llanos, Jr., James
Lockhart, Chuck
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Love, David
Magnuson, Judy
Martin, Angelo
Martin, Roy
Martinez, James
Merrill, Ira and Lucille
Mortell, Mike
Mosenthin, Elizabeth
Murphy, Steve
Myren, Richard T.
Naslund, Dave
Nelson, Less
Nicholson, Kent
Normand, Arthur
Nuget, Sue
O'Buckley, Mary
Paden, Ronald L.
Parker, Doreen
Peavey, Steve
Peratrovich, Bill
Pitcher, Kim
Price, Kirk
Randrump, Joel
Ratajczak, Carol
Reinhart, Troy
Reno, Brian
Rice, Peter E.
Robinson, L. Scott
Rockne, Thomas W.
Rodgers, Bill
Roeber, Matt
Rollenhagen, Rochelle
Rotecki, Bill
Roulston, Susan
Rowland, Pat
Sallee, Mike
Sallup, Paul and Rhonda
Sanderson, Robert
See, Jim and Kathy
Shoaf, Bill
Shuham, Walter W.
Sinclair, Duane J.
Smith, Pete
Smith, Wilbur
Spigai, David
Stack, Lyle T.
Starkweather, Cathy
Stevens, U.S. Senator Ted
Stirling, Dale A.
Thomas, Elwood
Thomas, Jody
Tierney, Patrick
Townsend, Guy H.
Turek, Mary Jo
Urbania, John
Voorhees, Linda
Watson, James P.
Weyhmiller, Joseph
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Alaska Department of Community and Regional Affairs, Office of the Commissioner
Alaska Department of Environmental Conservation
Alaska Department of Environmental Conservation, Environmental Quality Division
Alaska Department of Environmental Conservation, Public Affairs Office
Alaska Department of Fish and Game
Alaska Department of Fish and Game Advisory Committees
Alaska Department of Fish and Game Advisory Committees, Attn: Craig Loomis
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Alaska Department of Fish and Game Advisory Committees, Attn: Gretchen Goldstein
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Alaska Department of Fish and Game Advisory Committees, Attn: Joe Hotch
Alaska Department of Fish and Game Advisory Committees, Attn: John Vale
Alaska Department of Fish and Game Advisory Committees, Attn: Lonnie Anderson, Chairperson
Alaska Department of Fish and Game Advisory Committees, Attn: Michael Brooks, Chairperson
Alaska Department of Fish and Game Advisory Committees, Attn: Mim Robinson
Alaska Department of Fish and Game Advisory Committees, Attn: Pat Mills
Alaska Department of Fish and Game Advisory Committees, Attn: Patricia Phillips
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Alaska Department of Fish and Game Advisory Committees, Attn: Sam McBeen
Alaska Department of Fish and Game Advisory Committees, Attn: Skip Fabry
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Alaska Department of Natural Resources, Division of Parks & Outdoor Recreation
Alaska Department of Transportation and Facilities Planning, Maintenance Station
Alaska Division of Governmental Coordination
Alaska Forest Association
Alaska Legislative Information Office
Alaska Native Brotherhood
Alaska Native Brotherhood Camp #15
Alaska Native Brotherhood Camp #9
Alaska Native Sisterhood Camp #15
Alaska Native Sisterhood Grand Camp #15
Alaska Native Sisterhood Grand Camp #9
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Alaska Pulp Corporation
Alaska Ship & Dry Dock, Attn: Lloyd Gossman
Alaska Women in Timber, Attn: Lydia Harris
Alaskan Star Charters, Attn: Ken Wyrick
Alaskans for Responsible Res. Mgmt., Attn: Sylvia Geraghty
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Best Western Landing

Biowest, Attn: Gordon Yonker
Bishop Log Salvage, Attn: Stanley A. Bishop
Brusich Lease and Rental, Attn: Daniel A. Brusich
Campbell Towing Company
Cape Fox Corporation
Center for Urban Affairs & Policy Research, Northwestern University, Attn: Paul Friesema
Central Council of Tlinget and Haida
Citizen's Advisory Commission on Federal Areas, Attn: Stan Leaphart, Executive Director
Citizen's Advisory Committee, Attn: Dennis Watson
City of Coffman Cove
City of Craig
City of Hydaburg
City of Klawock
City of Klawock, Attn: Marilyn Westfall
City of Metlakatla, Attn: Mayor
City of Saxman, Attn: Forrest DeWitt, Jr., Vice Mayor
City of Saxman, Attn: Mayor
City of Thorne Bay, Attn: Ginny L. Tierney, City Administrator
City of Wrangell, Attn: Hon. Donald J. House, Mayor
Coffman Cove Civic Club
Community of Cape Pole, Attn: Paul Cummings
Cooke Cablevision Inc.
Craig Community Association, Attn: Jeff Sheakley, Vice President
Craig Public Library
Craig Ranger District
Department of Interior, Fish and Wildlife Service
Department of Transportation and Public Facilities, Maintenance Station, Attn: Dale Kubik
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Shee Atika, Inc.
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Southeast Alaska Business Journal
Southeast Alaska Conservation Council, Attn: Buck Lindekugel
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M.S., Botany, University of Washington, 1982

B.S., Biology/Ecology, Marlboro College, Vermont, 1978

Harza: Terrestrial Biologist, 11 years

Puget Sound Power & Light Co.: Biologist, 1 year

Contribution:

Threatened, Endangered, Sensitive Plants

Floodplains

Wetlands

Riparian Areas

Fisheries

Cindi Confer, Lead Fish and Wildlife Biologist

B.S., Wildlife Science, Oregon State University, 1988

Harza: Wildlife Biologist, 5 years

USFS Regions 1 & 6: Wildlife Biologist, seasonal 3 years

Contribution:

Wildlife Analysis

TES Wildlife

Management Indicator Species

Conservation Biology Strategies

Access Management

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M.S., Forest Resource Management, University of Washington, 1990

B.S., Forest Management, Washington State University, 1985

Silviculture Institute (currently enrolled)

Harza: Forest Resources Scientist, 5 years

Resource Mapping and Management: Forester and Aerial Photo Interpreter, 2 years

Plum Creek Timber Company, L.P.: Forester, 3 years

Champion International: Forester, seasonal 1 year

USFS Region 1: Forestry, seasonal 1 year

Contribution:

Forest Resources

Timber Inventory

Silviculture

JoAnn Metzler, Lead Watershed Specialist and Hydrologist

B.S., Watershed Science, Colorado State University, 1982

Terrapin Environmental: Consulting Hydrologist, 4 years

Jones & Stokes, Associates: Hydrologist, 2 years

Hosey & Associates Engineering Company: Hydrologist, 1 year

University of Washington Center for Streamside Studies: Hydrologist, 5 months

USFS Regions 6: Hydrologist, 7 years

USFS Region 1: Hydrologist, seasonal 3 years

Contribution:

Water Quality and Use

Channel Stability

Mass Movement/Wasting

Jim Brady, Lead Forester/Silviculturist

B.S., Forest Engineering, Oregon State University, 1955

B.S., Forest Management, Oregon State University, 1955

Forest Resource Options: Consulting Forester/Silviculturist, 10 years

Plum Creek Timber Company: Forest Resources, Vice-President and General Manager, 30 yrs.

Dwyer Lumber Company: Forester/Logger, 1 year

B.H. McGillicudy: Forester, 1 year

Contribution:

Forest Resources

Silvicultural Precriptions

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B.S., Forest Engineering, Oregon State University, 1986

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Stuntzner Engineering and Forestry: Logging Engineer, 8 years

Bechtel Civil Inc.: Civil Engineer, 2 years

Contribution:

Logging Engineering

Transportation

Craig Cooper, Geologist

M.S., Geological Sciences, Western Washington University, 1994

B.A., Business Administration, University of Washington, 1986

Certification: Practical Karst Hydrology with emphasis on Groundwater Monitoring

Harza: Geologist, 3 years

Contribution:

Craig Cooper, Geologist, *continued*

Geological and Cave Resources

Phase I Karst Studies

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Ph.D., Candidate, State University of New York, Binghamton

B.A., Social and Behavioral Sciences, Johns Hopkins University, 1973

Impact Assessment , Inc.: Field Researcher and Analyst, 9 years

Contribution:

Subsistence

Access Management

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Graduate work, University of Colorado, completed 1977

M.S., Anthropology, University of New Mexico, 1972

B.A., Anthropology, University of New Mexico, 1969

Historical Research Associates: Vice-President/Program Manager, 16 years

Contribution:

Cultural Resources

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M.A., Economics, University of Delaware, 1987

B.A., Biology, University of Delaware, 1974

E-3 Consulting: Economist/Biologist, 3 years

LGL Alaska Research Associates: Economist/Biologist, 2 years

North Pacific Fishery Management Council: Economist, 4 years

Mid-Atlantic Fishery Management Council: Economist, 2 years

University of Delaware: Instructor, 1 year

Contribution:

Economics

Social Sciences

Rick Suttle, Lead Recreation/Visual Resource Specialist

MLA., Landscape Architecture, University of Michigan, 1978

B.S., Natural Resources, University of Michigan, 1975

Harza Engineering Company: Senior Site and Recreation Planner, 18 years

University of Michigan: Teaching Assistant, 2 years

Rick Suttle, Lead Recreation/Visual Resource Specialist, *continued*

Sea Grant Institute, Coastal Zone Laboratory: Researcher, 1 year

Contribution:

Recreation

Visual Resources

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Ph.D., Anthropology, University of California, San Diego, 1979

M.A., Asian Studies, California State University, Long Beach, 1974

B.A., Asian Studies, California State University, Long Beach, 1973

B.A., Anthropology, California State University, Long Beach, 1972

Impact Assessment, Inc.: Project Manager, 15 years

Contribution:

Socioeconomics

James H. Thrall, Project Manager

Ph.D., Biological Science, Illinois State University, 1972

M.A., Biological Science, St. Mary's College, 1967

B.A., Biology, St. Mary's College, 1964

Locher Interests, Ltd., Project Manager, 2 year

Harza: Vice-President/Project Manager, 20 years

Contribution:

Air Quality

Fisheries

Marine Environment

Larry Lunde, Contracting Officer's Representative [COR]

B.S., Forest Management, Washington State University, 1973

USFS Regions 1, CA, 6, 10: District Resource Staff/District Ranger, 19 years

Contribution:

USFS Team Leader

NEPA Analysis

Timber Supply

Joan Nichol, NEPA, Writer/Editor, Document Production Manager

Zoology, University of Washington, 1969-73

Harza: Environmental Planner, 15 years

Contribution:

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B.S., Forest Engineering, Oregon State University, 1964

Stuntzner Engineering and Forestry: Owner/Partner, 28 years

Contribution:

Logging Engineering

Transportation

Richard Bielefeld, Geologist

Postgraduate, Civil Engineering, Long Beach State University, CA 1961

B.S., Geology, Long Beach State University, CA, 1961

Harza: Senior Geologist, 2 years

Kaldveer Associates, Inc.: Regional Manager, 2 years

Earth Consultants, Inc.: Senior Project Manager, 1 year

Purcell Rhodes and Associates: Project Manager, 1 year

Golder Associates: Project Geologist, 2 years

Rockwell Hanford Operations: Team Leader/Senior Engineer, 8 years

Contribution:

Geological and Cave Resources

Phase I Karst Studies

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Cliff Barnhart, Logging Engineer

B.S., Forest Engineering, Oregon State University, 1987

Stuntzner Engineering and Forestry: Logging Engineer, 3 years

Hull-Oakes Lumber Company: Forester, 4 years

Contribution:

Logging Engineering

Transportation

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B.S., Forest Science, University of Illinois, Champaign-Urbana, 1987

Harza: Terrestrial Ecologist, 5 years

USFS Region 6: Forestry/Biological Technician, seasonal 4 years

Maria Hall, Terrestrial Ecologist, *continued*

Contribution:

Biodiversity

Old Growth

Conservation Biology Strategies

Planning Record

John Goering, Forester

B.S., Forest Management, Oregon State University, 1992

Harza: Forester, 2 years

USFS Regions 1 & 6: Forester, (NTE) 1 year: Forestry Technician, seasonal 3 years

Contribution:

Timber & Vegetation Resource Analysis

Timber Inventory

Steve Bedross, Recreation/Visual Resource Specialist

MLA., Landscape Architecture, University of Michigan, 1990

B.S., Natural Resources, University of Michigan, 1987

Harza Engineering Company: Visual and Recreational Planner, 5 years

Johnson, Johnson, and Roy, Inc.: Landscape Architect, seasonal 1 year

City of Southfield, MI: Lanscape Architect, seasonal 1 year

Michigan Dept. of Transportation: Biologist, seasonal 1 year

USFS Colorado Region: Biological Technician, seasonal 1 year

Contribution:

Recreation

Visual Resources

Bob Burke, Geologist

Ph.D., Geological Sciences, University of Washington, 1979

M.S., Geological Sciences, University of Washington, 1971

B.S., Geological Sciences, San Diego State University, 1969

Golder Associates: Senior Engineering Geologist, 12 years

Dowl Engineering: Geologist, 2 years

Contribution:

Karst Resources

Kathy Dube, Geologist

M.S., Geological Sciences, University of Washington

B.S., Environmental Sciences and Resource Management, Lehigh University

Harza: Geologist, 11 years

Contribution:

Soils Resources

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M.S., Fisheries and Quantitative Science, University of Washington, 1989

B.S., Wildlife Biology, Colorado State University, 1980

Terrapin Environmental: Fisheries Biologist, 2 years

Resources Northwest: Fisheries Biologist, 1 year

Harza: Fish and Wildlife Biologist, 3 years

USFS Region 6: Fish and Wildlife Biologist, 7 years

Contribution:

Fisheries

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B.S., Electrical Engineering, University of Arizona, 1991

Harza: GIS Analyst/Electrical Engineer, 2 years

City of Bellevue, WA: GIS Analyst, Seasonal 5 years; Full-time 1 year

Contribution:

GIS Analysis and Mapping

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M.S., Urban Planning, University of Washington, 1987

B.S., Political Economy and Natural Resources, University of California, Berkley, 1983

Mentat Consultants: GIS Consultant, 5 years

City of Bellevue, WA: Planning Analyst, 3 years

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GIS Analysis and Mapping

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